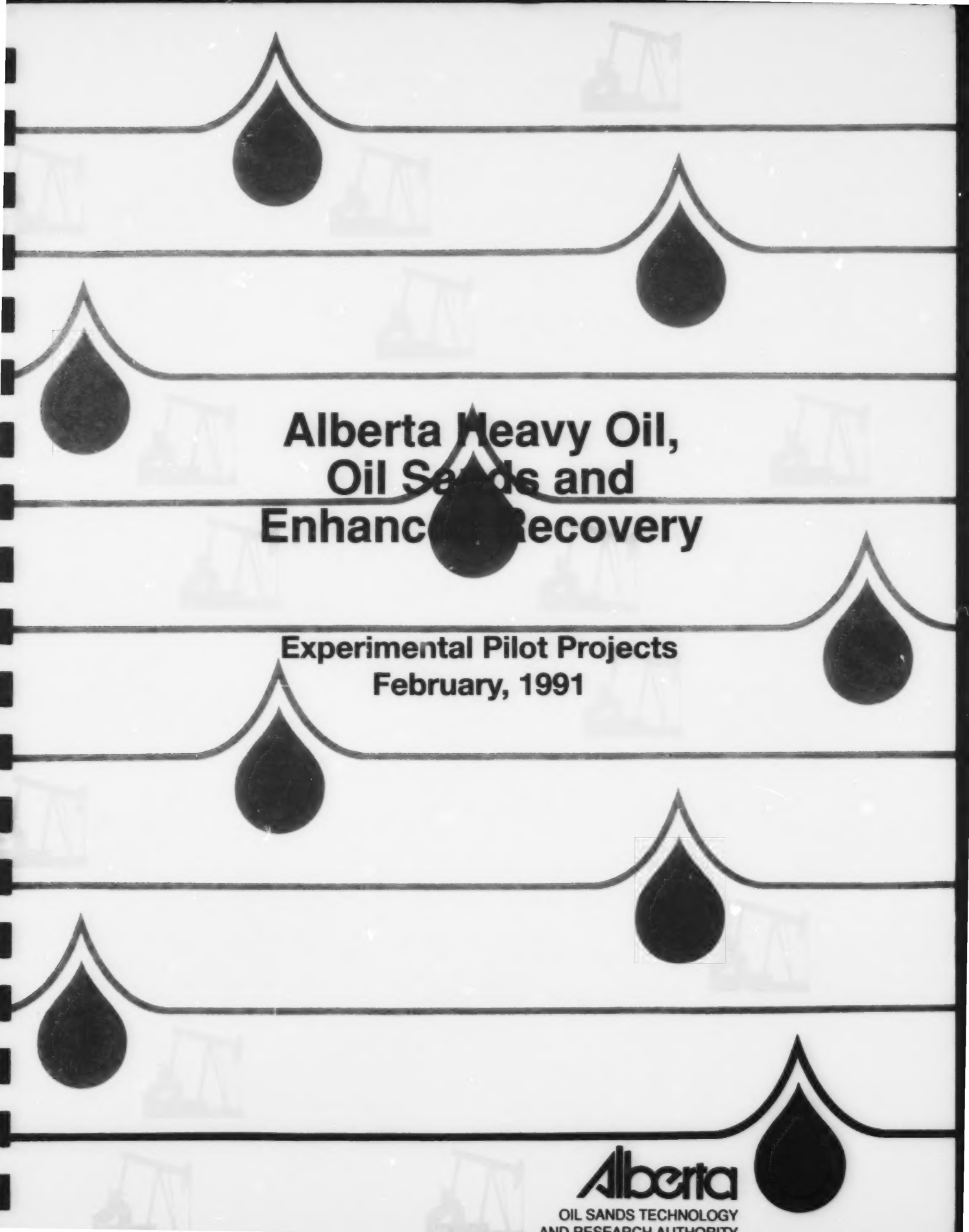
Alberta Heavy Oil, Oil Sands and Enhanced Recovery

Experimental Pilot Projects
February, 1991



Alberta

OIL SANDS TECHNOLOGY
AND RESEARCH AUTHORITY

Alberta Heavy Oil, Oil Sands and Enhanced Recovery

Experimental Pilot Projects
February, 1991

A Survey Compiled by:

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Summary

The 1991 survey provides detailed coverage of all of Alberta's sixty-six active or recently terminated in situ heavy oil, oil sands and enhanced oil recovery pilot projects. Each pilot project listed contains the following information:

- a detailed reservoir description
- a detailed field facilities description
- well pattern
- project-specific description of EOR process employed
- historical documentation of the engineering events associated with the project
- description of important adjustments made to improve the process performance.

AOSTRA participates in 20 of the projects and operates the Underground Test Facility.

Acknowledgements

AOSTRA gratefully acknowledges the cooperation of all the operators who provided the information contained in this survey. Once again, we have been able to secure 100% participation.

If you have any comments on how the survey can be improved, please contact AOSTRA/Calgary at (403) 297-3380.

PILOT PROJECTS IN ALBERTA
Currently Operating February, 1991

Operator	Sector
Alberta Energy Company Ltd.	Suffield Horizontal Well Suffield Horizontal Well #2 (New)
Alberta Oil Sands Technology and Research Authority	Athabasca*
Amoco Canada Petroleum Company Ltd.	Brintnell Cessford* David Drumheller Horizontal Well (New) Gregoire lake - Phase B* Morgan Soars Lake (Beaverdam) Soars Lake (Beaverdam)(New Project)
BP Canada Inc.	Chauvin South Sparky 'E'
Bumper Development Corporation Ltd.	Twining Rundle 'A' Pool*
Canada Northwest Energy Ltd.	Atlee Buffalo
Canadian Hunter Exploration Ltd.	Swan Hills Beaverhill Lake*
Chevron Canada Resources Ltd.	Taber
Esso Resources Canada Ltd.	Fisher Creek Leming May/Ethel Rainbow Redwater
Home Oil Company Ltd.	Kitscoty
Husky Oil	Caribou Lake (New) Kearl Lake*
Koch Exploration Canada Ltd.	Fort Kent
Mazzei Oil & Gas Ltd.	Frog Lake (New)
Mobil Oil Canada, Ltd.	Iron River Wolf Lake Extension (New)
Norcen Energy Resources Ltd.	Lindbergh I Lindbergh II Lindbergh III Lloydminster Horizontal Well (New) Provost (Bodo)*

PanCanadian Petroleum Ltd.	Countess B* Lindbergh - Elk Point
Petro-Canada Resources	PCEJ (New)
Renaissance Energy Ltd.	Horizontal Well (New)
Vikor Resources Ltd.	Joffre II*

*AOSTRA Participation

APPENDIX

Recently Terminated Pilot Projects

Operator	Sector
Alberta Energy Company Ltd.	Ipiatik Lake Phase A Ipiatik Lake Phase B Suffield I* Suffield II* Suffield Hot Water Flood*
Amoco Canada Petroleum Company Ltd.	Atlee Buffalo Gregoire Lake Phase A*
Bow Valley Industries Ltd.	Marie (Cold Lake)*
BP Canada Inc. (Petro-Canada 50%)	Marguerite Lake* Project Owl
Canadian Occidental Petroleum Ltd.	Manatokan Morgan
CS Resources Ltd.	Pelican
Esso Resources Canada Ltd.	Leduc
Excel Energy Inc.	Ardmore
Gulf Canada Resources Ltd.	Fenn-Big Valley*
Mobil Oil Canada, Ltd.	Kitscoty Wolf Lake
Murphy Oil Company Ltd.	Lindbergh Morgan
PanCanadian Petroleum Ltd.	Lindbergh
Petro-Canada Resources	Hangingstone I Hangingstone II Hangingstone III Viking-Kinsella B*
Signalta Resources Ltd.	Pembina-Lobstick
Vikor Resources Ltd.	Joffre I*
Ulster Petroleums Ltd.	Retlaw* (Applied for Commercial Project Status)

*AOSTRA Participation

Alberta Energy Company

Suffield Horizontal Well

LOCATION

LSD 5I Section: 34 Township: 19 Range: 8 W4M

PARTNERS:

Alberta Energy Company Limited	70%
Westcoast Petroleum Ltd.	30%

PROCESS: Horizontal Well
START-UP: October 1987
TERMINATION: In Progress

DESCRIPTION

PILOT AREA: Single well test
WELL PATTERN: Horizontal section extends 251 metres in oil pay.
NO. OF WELLS: one

FACILITIES

ARTIFICIAL LIFT METHODS: Conventional Beam Pumpjack
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Glauconite Sandstone
Depth to Top of Formation:	938 m.KB
Reservoir Thickness:	
net:	15 m
gross:	18 m
Original Temperature:	30°C
Original Pressure:	10000 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	25%
Average Water Saturation S_w	25% pore vol.
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	395 mPa.s
Oil Gravity at Reservoir Temp	970-975 Kg/m^3
Source:	Pilot Operator

Alberta Energy Company

Suffield Horizontal Well #2

LOCATION

LSD 6D Section: 3 Township: 20 Range: 8 W4M

PARTNERS:

Alberta Energy Company Limited	70%
Westcoast Petroleum Ltd.	30%

PROCESS: Horizontal Well
START-UP: February 1988
TERMINATION: In Progress

DESCRIPTION

PILOT AREA: Single well test
WELL PATTERN: Horizontal section extends 655 metres in oil pay.
NO. OF WELLS: one

FACILITIES

ARTIFICIAL LIFT METHODS: Conventional Beam Pumpjack
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Glauconite Sandstone
Depth to Top of Formation:	938 m.KB
Reservoir Thickness: net:	8 m
Original Temperature:	30°C
Original Pressure:	10000 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	25%
Average Water Saturation S_w	25% pore vol.
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	395 mPa.s
Oil Gravity at Reservoir Temp.	970-975 Kg/m^3
Source:	Pilot Operator

AOSTRA

Underground Test Facility

LOCATION

LSD 2,3,14 & 15 Section: 7,18 Township: 93 Range: 12 W4M

PARTNERS:
Access Stage - 100% AOSTRA
Phase B Process Test
- AOSTRA
- Amoco Canada Petroleum Company Ltd.
- Chevron Canada Resources Limited
- Mobil Oil Canada
- Petro-Canada Inc.
- Shell Canada Limited
- Esso Resources Canada Ltd.

PROCESS: Shaft & Tunnel Access to Horizontal Well Drilling.
Horizontal Well Processes:
Steam-Assisted Gravity Drainage (SAGD)
COST: Capital: $56,000,000 mine/wells/facilities/ roads
START-UP:
Mine Access: September 1986
Phase A Processes: November 1987
Phase B Processes: July 1991
TERMINATION:
Phase A 1990

DESCRIPTION

PILOT AREA:
Phase A: 1.0 ha
HASDrive: 0.3 ha
Phase B: 11 ha
WELL PATTERN:
Phase B: 3 pairs of horizontal wells; 600 m length; end 500 m completed
WELL SPACING:
75 m between wellpairs
OBSERVATION WELLS:
Phase B: 3 wells containing a mix of temperature and geotechnical instrumentation.

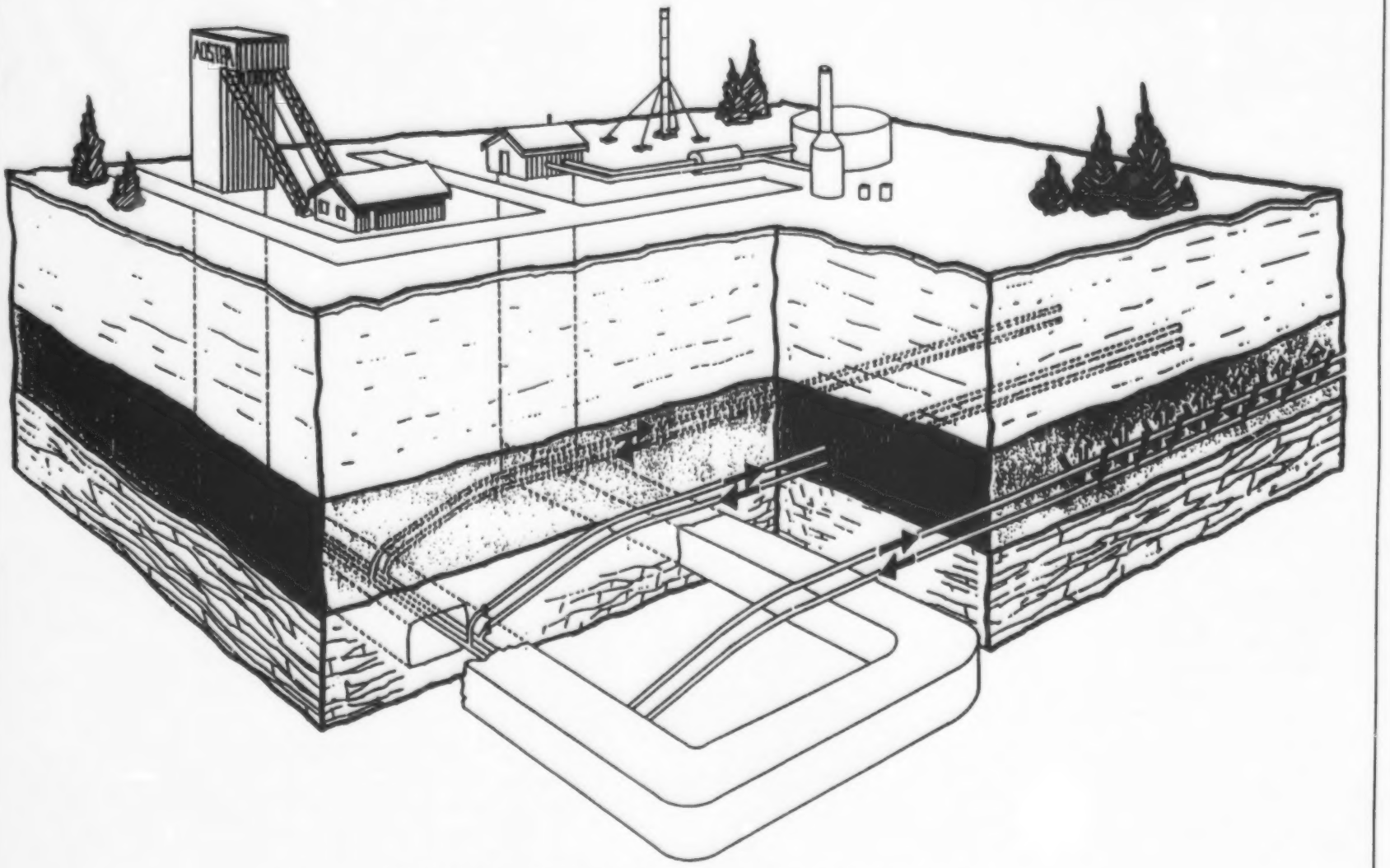
FACILITIES

MINE ACCESS:
Two 3-4 m I.D. access shafts 213 m deep; 1500 m of tunnel, 5 m wide x 4 m high cross-section; high speed hoist in #1 shaft

PROCESS:
One 7,000,000 BTU/hr and one 25,000,000 BTU/hr. steam generator; pumping or steam lift if required; simple gas separation & shipment of produced fluids. 50,000,000 BTU/hr. boiled and full treating facilities planned early 1992.

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	135 m.KB
Reservoir Thickness:	
net:	22 m
Original Temperature:	7°C
Original Pressure:	450 kPa
Average Horizontal Permeability:	5000 md
Average Porosity:	35%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore vol.
Oil Viscosity at Reservoir Temp.	5,000,000 mPa.s
Oil Gravity at Reservoir Temp.	1014 Kg/m^3
Source:	AOSTRA



UNDERGROUND TEST FACILITY

Amoco Canada Petroleum Company Ltd.
Brintnell

LOCATION

LSD 6 Section: 24 Township: 81 Range: 23 W4M
LSD 10 Section: 15 Township: 81 Range 23 W4M
LSD: 5 Section: 1 Township: 81 Range 23 W4M
LSD: 7 Section: 23 Township: 80 Range 23 W4M
LSD: 5 Section: 24 Township: 80 Range 23 W4M

PARTNERS:
Amoco Canada Petroleum Company Ltd. 100%

PROCESS: Steam Stimulation
START-UP: November 1985
TERMINATION: March 1986 (reactivated in 1988)

DESCRIPTION

Single Well Cyclic Steam Stimulation Program
WELL SPACING: 64.75 ha
NO. OF WELLS:
Injection/Production 25

FACILITIES

STEAM GENERATOR(S): one - 22 GJ/hr steam generator - portable
ARTIFICIAL LIFT METHODS: Beam Pump and Progressive Cavity Pumps
STORAGE FACILITIES: 120 m^3 Tanks

RESERVOIR

Geological Horizon:	Wabiskaw
Depth to Top of Formation:	425 m.KB
Reservoir Thickness:	
net:	7 m
gross:	15 m
Original Temperature:	28°C
Original Pressure:	2700 kPa
Average Porosity:	28%
Average Water Saturation S_w	35%
Average Oil Saturation S_o	65% pore vol.
Oil Viscosity at Reservoir Temp.	360 mPa.s
Oil Gravity at Reservoir Temp.	940 Kg/m^3
Primary Production Rates:	3 m^3/well/day
Source:	Pilot Operator

COMMENTS

This project was suspended in March, 1986 due to low heavy oil prices and reactivated in 1988. Two horizontal wells were drilled in 1988.

Two electromagnetic wells were drilled in 1990. Two additional horizontal wells were drilled in late 1990.

Amoco Canada Petroleum Company Ltd.
Cessford

LOCATION

Section: 34,27,23,11,10,3 Township: 25
Range: 12 W4M

PARTNERS:

Initial Phase:	
Amoco Canada Petroleum Company Ltd.	54.1%
Esso	49.9%
Incremental Phase:	
AOSTRA	50.0%
Amoco Canada Petroleum Company Ltd.	27.05%
Sulpetro	22.95%

PROCESS: Caustic Polymer Flood
COST: Capital - 2,500,000
Operating - $1,700,000/year
START-UP: Waterflooding in 1981, caustic flooding in July 1984, polymer flooding in January 1985.
TERMINATION: November 1992

DESCRIPTION

PILOT AREA: 260 ha
WELL PATTERN: Five 5-Spots and two line drive
WELL SPACING: 32 ha
NO. OF WELLS:

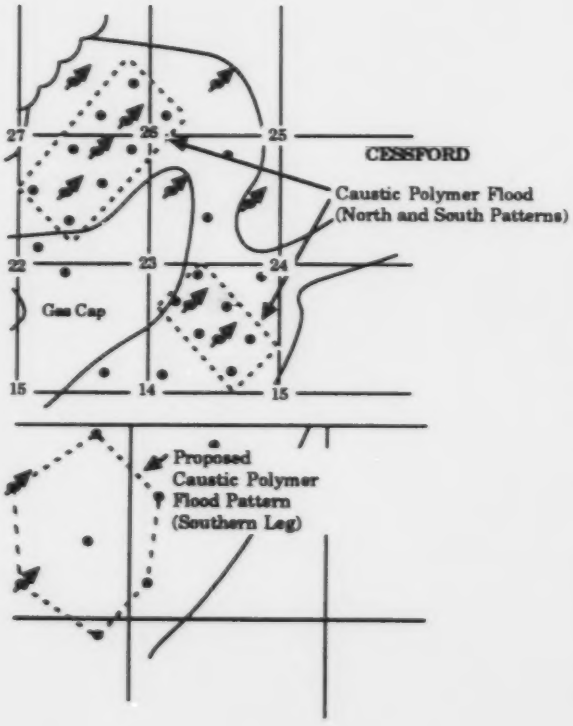
Injection	7
Production	19
Observation	0

FACILITIES

Water ion - exchange softeners with individual pumping units.
ARTIFICIAL LIFT METHODS: Conventional Beam Pumps
STORAGE FACILITIES: Tanks
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Basal Colorado A Sandstone
Depth to Top of Formation:	884-905 m.KB
Reservoir Thickness:	
net:	4 m
gross:	4 m
Original Temperature:	30°C
Original Pressure:	8720 kPa
Average Horizontal Permeability:	200-400 md
Average Porosity:	24%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	24 mPa.s
Oil Gravity at Reservoir Temp.	912 Kg/m^3
Source:	Pilot Operator



Amoco Canada Petroleum Company Ltd.
David

LOCATION
Section: 2&11 Township: 41 Range: 3 W4M

PARTNERS:

Amoco Canada Petroleum Company Ltd.	49%
Encor	24.75%

PROCESS: Alkaline Polymer Injection
START-UP: 1986
TERMINATION: 1992

COMMENTS: The project completed the target pore volume slug of alkali/polymer in December, 1990. Two patterns are now on a tapered polymer slug while the other five injection patterns are on just fresh water injection as they have completed their tapered polymer slug size.

Primary production period	1969 to 1978
Waterflood	1978 to 1986
Tertiary (alkali/polymer)	1986 to ?

DESCRIPTION

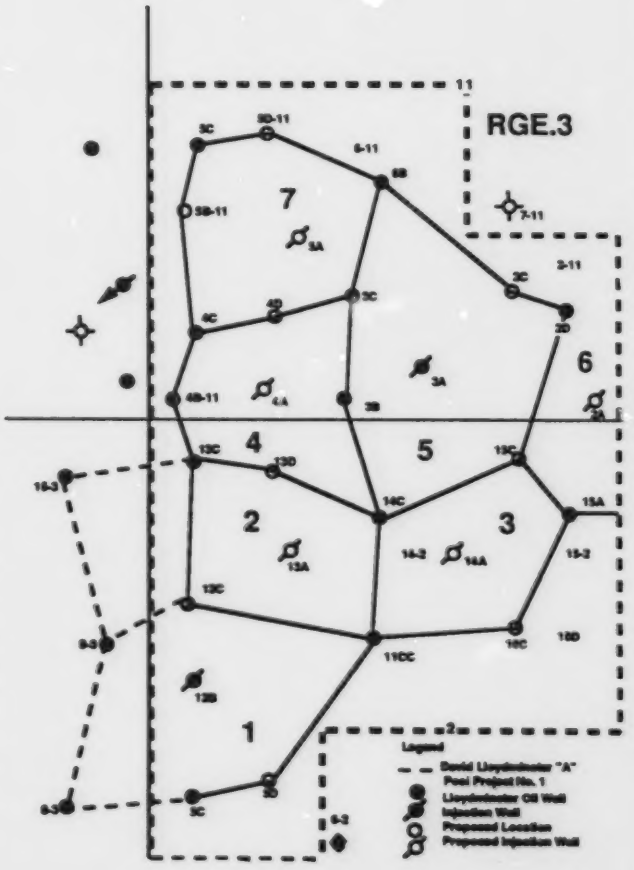
PILOT AREA: 99 ha
WELL PATTERN: Irregular
WELL SPACING: 8 & 4 ha

NO. OF WELLS:

Injection	7
Production	21
Observation	0

FACILITIES

ARTIFICIAL LIFT METHODS: Pumps
TREATER TYPE: Pressure Treaters
STORAGE FACILITIES: Tanks
TRANSPORT: Pipeline



RESERVOIR

Geological Horizon:	Lloydminster
Depth to Top of Formation:	760 m.KB
Reservoir Thickness: net:	3.2 m
Original Temperature:	30.6°C
Original Pressure:	5580 kPa
Average Horizontal Permeability:	1480 md
Average Porosity:	29%
Average Water Saturation S_w	27%
Average Oil Saturation S_o	73% pore vol.
Oil Viscosity at Reservoir Temp.	34.2 mPa.s
Oil Gravity at Reservoir Temp.	918 Kg/m^3
Primary Production Rates:	12 m^3/well/day
Source:	Pilot Operator

Amoco Canada Petroleum Company Ltd.
Drumheller Horizontal Well

LOCATION
LSD 14 Section: 13 Township: 29 Range: 20 W4M

PARTNERS:

Amoco Canada Petroleum Company Ltd.
Norcen Energy Resources Ltd.
Okanagan Petroleums Ltd.
Twin Richfield Ltd.
Voyager Energy Co.
N.L. Easley
S. Whipple

PROCESS: Short Radius Horizontal Well
COST: $936,000
START-UP: January 15, 1988
TERMINATION: Rig Release February 18, 1988; On Stream March 10, 1988

DESCRIPTION

WELL SPACING: 80 acre in Sec. 13
NO. OF WELLS:
1 horizontal well drilled

FACILITIES

ARTIFICIAL LIFT METHODS: Reda Submersible Pump

RESERVOIR

Geological Horizon:	Nisku/Dolomite
Depth to Top of Form.:	Porosity top~ 830 ASL
Reservoir Thickness:	
net:	5 m
gross:	30 m
Original Temperature:	56°C
Original Pressure:	13,338 kPa
Average Horizontal Permeability:	40 md
Average Porosity:	7.5%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore vol.
Oil Viscosity at Reservoir Temp.	1.3 mPa.s
Oil Gravity at Reservoir Temp.	850 Kg/m^3
Source:	Pilot Operator

Amoco Canada Petroleum Company Ltd.
Gregoire Lake - Phase B

LOCATION

LSD 5 Section: 2 Township: 86 Range: 7 W4M

PARTNERS:

AOSTRA	85.71%
Amoco Canada Petroleum Company Ltd.	14.29%

PROCESS: Steamflood with additives (Surfactant, natural gas, air and pressure cycling)
COST: Capital - nil
Operating - $1,600,000 to December 31, 1990
START-UP: January 1, 1990
TERMINATED: March 31, 1991

DESCRIPTION

PILOT AREA: 0.28 ha
WELL PATTERN: Inverted 4-Spot
WELL SPACING: S/B 0.19 ha/well
NO. OF WELLS:

Injection	1
Production	3
Observation	3

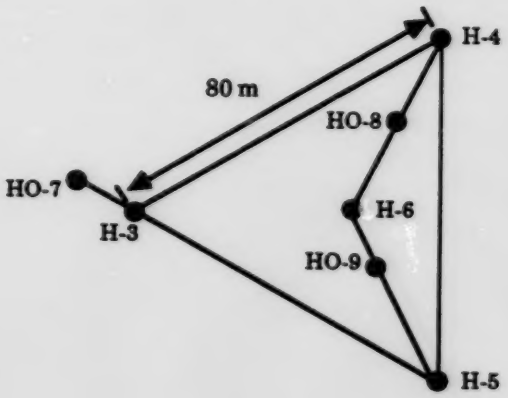
FACILITIES

STEAM GENERATOR(S): one - 26.4 GJ/hr
ARTIFICIAL LIFT METHODS: Conventional Beam Pump
TREATER TYPE: Atmospheric tankage plus diluent
STORAGE FACILITIES: Bitumen/Diluent - 400 m^3
Emulsion - 400 m^3, Water - 400 m^3
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	187 m.KB
Reservoir Thickness:	
net:	41 m
gross:	47 m
Original Temperature:	10°C
Original Pressure:	531 kPa
Average Porosity:	36.4%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	850,000 (est) mPa.s
Oil Gravity at Reservoir Temp.	1018 Kg/m^3
Source:	Pilot Operator

COMMENTS:
Steaming operations initiated on October 27, 1986 to heat the production wellbores. A production cycle was started on January 16, 1987.



Distance From H-6
HO-8 25 m
HO-9 15 m

Amoco Canada Petroleum Company Ltd.
Morgan

LOCATION

LSD 35 Section: 35 Township: 51 Range: 4 W4M

PARTNERS:

Amoco Canada Petroleum Company Ltd. 100%

PROCESS: Pressure Cycle In Situ Air Combustion
COST: Capital -$22.3 Million
Operating - $3.9 Million for 1987
START-UP: June 1981
TERMINATION: 1995

DESCRIPTION

PILOT AREA: 260 ha
WELL PATTERN: Inverted 7-Spot
WELL SPACING: 4 ha/well
NO. OF WELLS:

Injection	7
Production	39
Observation	0

FACILITIES

STEAM GENERATOR(S): two - 26 GJ/hr
AIR COMPRESSORS: one - 90,600 m^3/d @ 6.9 MPa
ARTIFICIAL LIFT METHODS: HEP Units and liner pumps
TREATER TYPE: Pressure and Flash treaters
STORAGE FACILITIES: Oil - 1500 m^3, Water - 800 m^3
TRANSPORT: Husky Pipeline

RESERVOIR

Geological Horizon:	Lloydminster A
Depth to Top of Formation:	580 m.KB
Reservoir Thickness:	
net:	10 m
gross:	10 m
Original Temperature:	24°C
Original Pressure:	3230 kPa
Average Horizontal Permeability:	2000 md
Average Porosity:	30%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	5688 mPa.s
Oil Gravity at Reservoir Temp.	973 Kg/m^3
Primary Production Rates:	2.2 m^3/well/day
Source:	Pilot Operator

COMMENTS: Air injection is marginally profitable at low oil prices. An air pressure up blow down strategy is being used successfully. A fourth pressure cycle was initiated in 1990 with the intention of going to more frequent, but lower pressure cycles in the future. Conversion to a combination thermal drive is still planned sometime in the future.

Amoco Canada Petroleum Company Ltd.
Soars Lake (Beaverdam)

LOCATION
Section: 13,14,23,24,25,26,35,36 Township: 59
Range: 2 W4M
Section: 19 Township: 59 Range: 1 W4M

PARTNERS:

Amoco Canada Petroleum Company Ltd.	100%

PROCESS: Steam Stimulation
START-UP: June 1, 1985
SUSPENDED: May, 1986
REACTIVATED: 1988

DESCRIPTION

Single Well Cyclic Steam Stimulation Program

WELL SPACING: 64.75 ha
NO. OF WELLS:

Injection/Production	18

FACILITIES

STEAM GENERATOR(S): one 7.3 MW portable steam generator
ARTIFICIAL LIFT METHODS: Beam Pump and Progressive Cavity Pump
STORAGE FACILITIES: 120 m^3 Tanks

RESERVOIR

Geological Horizon:	Sparky
Depth to Top of Formation:	450 m.KB
Reservoir Thickness:	
net:	10 m
gross:	20 m
Original Temperature:	22°C
Original Pressure:	2800 kPa
Average Horizontal Permeability:	1200 md
Average Porosity:	30%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	20,000 mPa.s
Oil Gravity at Reservoir Temp.	985 Kg/m^3
Primary Production Rates:	2.0 m^3/well/day
Source:	Pilot Operator

COMMENTS
This project was suspended in May, 1986 due to low heavy oil prices and reactivated in 1988.

Currently attempting to evaluate primary production potential of the area.

Amoco Canada Petroleum Company Ltd.
Soars Lake (Beaverdam) (New Project)

LOCATION

LSD 14 Section: 19 Township: 59 Range: 1 W4M

PARTNERS:

Amoco Canada Petroleum Company Ltd. 100%

PROCESS: Steam Stimulation
START-UP: June, 1988
TERMINATION:

DESCRIPTION

Single Well Cyclic Steam Stimulation Program

WELL SPACING: 4.047 ha
NO. OF WELLS:

Injection/Production	16
Observation	1

FACILITIES

STEAM GENERATOR(S): two 7.3 MW steam generators
ARTIFICIAL LIFT METHODS: HEP
STORAGE FACILITIES: Pressurized Treater, Treated Oil Trucked to Sales

RESERVOIR

Geological Horizon:	Sparky
Depth to Top of Formation:	450 m.KB
Reservoir Thickness:	
net:	10 m
gross:	20 m
Original Temperature:	22°C
Original Pressure:	2800 kPa
Average Horizontal Permeability:	1200 md
Average Porosity:	30%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	20,000 mPa.s
Oil Gravity at Reservoir Temp.	985 Kg/m^3
Primary Production Rates:	2.0 m^3/well/day
Source:	Pilot Operator

COMMENTS

Steaming above fracture pressure began in June, 1988. Well-to-well interference and sand production problems were initially severe. Steaming strategy and completions were revised in 1989 to reduce these problems. Additional data gathered in 1989 indicated that steaming above parting pressure was not effective. Steaming was suspended and effort is underway to create substantial voidage prior to additional steaming.

BP Canada

Chauvin South Sparky 'E'

LOCATION

LSD NW/4 Section: 24 Township: 42 Range: 3 W4M
LSD SW/4 Section: 25 Township: 42 Range: 3 W4M
LSD NE/4 Section: 26 Township: 42 Range: 3 W4M

PARTNERS:
BP Canada 100%

PROCESS: Mobility control polymer flood (using Xanthan - biopolymer)
COST: Capital - $370,000
Operating - $1,000,000 (chemical cost for 3 yrs. inj.)
$120,000/yr (general)
START-UP: February 1988
TERMINATION: February 1992

DESCRIPTION

PILOT AREA: 794.25 ha
WELL PATTERN: 2 inverted 5-Spots; 1 partial peripheral injection pattern.
WELL SPACING: 16 ha
NO. OF WELLS:

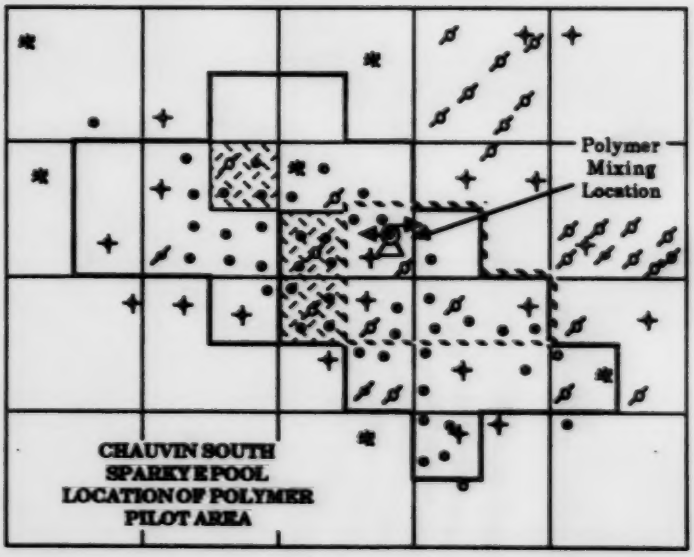
Production	11
Injection (polymer)	3

FACILITIES

One polymer blending unit
ARTIFICIAL LIFT METHODS: Standard Pump Jack and Bottomhole Rotary Pumps
TREATER TYPE: Standard Heater/Treater
STORAGE FACILITIES:
Formaldehyde tank - 210 bbl
Polymer tank - 750 bbl
TRANSPORT: All wells flowlined.

RESERVOIR

Geological Horizon:	Third Sparky Sand of the Mannville Group
Depth to Top of Formation:	650 m.KB
Reservoir Thickness:	
net:	3.0 m
gross:	3.2 m
Original Temperature:	29°C
Original Pressure:	4785 kPa
Average Horizontal Permeability:	1200 md
Average Porosity:	30%
Average Water Saturation S_w	19%
Average Oil Saturation S_o	81% pore vol.
Oil Viscosity at Reservoir Temp.	81 mPa.s
Oil Gravity at Reservoir Temp.	920 Kg/m^3
Primary Production Rates:	8 m^3/well/day
Source:	Pilot Operator



Bumper Development Corporation Ltd.
Twining Rundle 'A' Pool

LOCATION

LSD 12 Section: 16 Township: 31 Range: 24 W4M

PARTNERS:

Bumper Development Corporation Ltd.
Enron Oil Canada Ltd.
AOSTRA

PROCESS: Re-completion of a Pekisko oil well by drilling a single horizontal drainhole.
COST: $556,000
START-UP: October 1987
TERMINATION: January 1, 1992

DESCRIPTION

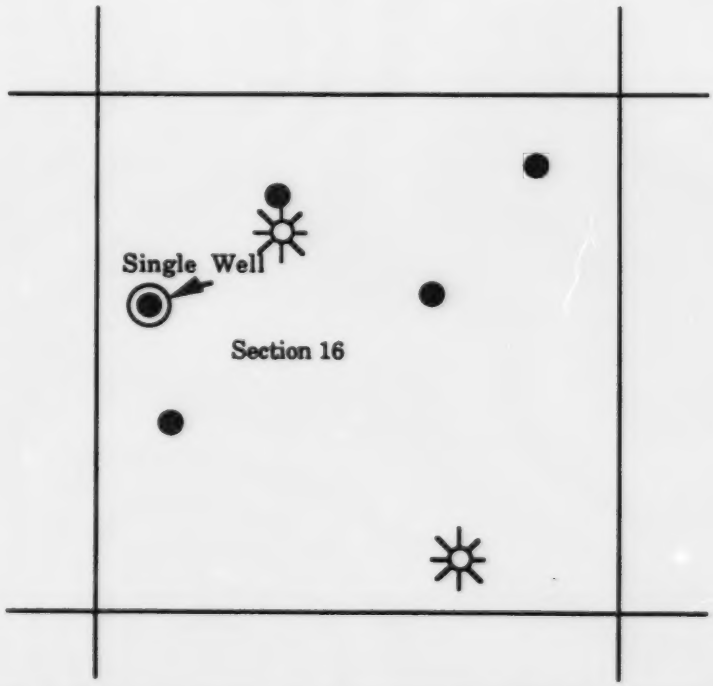
PILOT AREA: About 32 ha
WELL PATTERN: Single well
WELL SPACING: 32 ha
NO. OF WELLS:
One production well only.

FACILITIES

ARTIFICIAL LIFT METHOD: Reciprocating sub-surface pump.

RESERVOIR

Producing Formation:	Pekisko of the Twining Rundle 'A' Pool
Depth to Top of Formation:	1660 m.KB
Reservoir Thickness:	
net:	15 m
gross:	40 m
Original Temperature:	61°C
Original Pressure:	11410 kPa
Average Horizontal Permeability:	5 md
Average Porosity:	5.7%
Average Water Saturation S_w	36%
Average Oil Saturation S_o	64%
Oil Viscosity at Reservoir Temp.	1.6 mPa.s
Oil Gravity at Reservoir Temp.	876 Kg/m^3
Primary Production Rates:	1 m^3/well/day
Source:	Pilot Operator



Canada Northwest Energy Ltd.
Atlee - Buffalo

LOCATION

Section: 19,20&30 SW4M Township: 21 Range: 5 W4M

PARTNERS:

Sceptre Resources Limited	31.9771%
Murphy Oil	10.1835%
Canada Northwest Energy Ltd.	57.8394%

PROCESS: Cyclic Steam
COST: Capital - Using existing wells and facilities
START-UP: February 1, 1986
TERMINATION: Unknown at present.

DESCRIPTION

WELL PATTERN: Conventional 40 acre spacing at present.
WELL SPACING: 40 acre spacing
NO. OF WELLS:
10 huff and puff existing

FACILITIES

STEAM GENERATOR(S): one - 23.2 GJ/hr
ARTIFICIAL LIFT METHODS: Pump Jacks
TREATER TYPE: Colt
TRANSPORT: Truck to Bow River Terminal at Jenner

RESERVOIR

Geological Horizon:	Glauconite
Depth to Top of Formation:	892 m.KB
Reservoir Thickness:	
net:	10 m
gross:	10 m
Original Temperature:	26°C
Original Pressure:	10000 kPa
Average Horizontal Permeability:	2000 md
Average Porosity:	29%
Average Water Saturation S_w	23%
Average Oil Saturation S_o	77% pore vol.
Oil Viscosity at Reservoir Temp.	800 mPa.s
Oil Gravity at Reservoir Temp.	951 Kg/m^3
Primary Production Rates:	less than 5 m^3/well/day
Source:	Pilot Operator

COMMENTS: Potential of steamflooding is being reviewed. Current reservoir pressure is too low to justify a large scale cyclic steam operation. The pilot project has been shut-in pending a resolution of an ownership problem.

Canadian Hunter Exploration Ltd.
Swan Hills Beaverhill Lake

LOCATION

LSD 13 Section: 11 Township: 67 Range: 8 W4M

PARTNERS:

Canadian Hunter Exploration Ltd.	50%
AOSTRA	50%

PROCESS: Horizontal well recovery from a tight carbonate reservoir.
COST: $1,500,000 drill (not completed)
START-UP: January 1988
TERMINATION: Currently suspended

DESCRIPTION

PILOT AREA: Single well
NO. OF WELLS: 1

FACILITIES

ARTIFICIAL LIFT METHODS: Conventional rod pump and pump jack
TRANSPORT: Truck fluid out.

RESERVOIR

Geological Horizon:	Swan Hills Beaverhill Lake Formation
Depth to Top of Formation:	2268 m.KB
Reservoir Thickness: gross:	14 m
Original Temperature:	83.5°C
Original Pressure:	21000 kPa
Average Porosity:	5%
Average Water Saturation S_w	14%
Average Oil Saturation S_o	84% pore vol.
Oil Gravity at Surface Temp.	43°API
Source:	Pilot Operator

Chevron Canada Resources Ltd.
Taber

LOCATION

LSD 9 Section: 18 Township: 9 Range: 16 W4M

PARTNERS:

Lonlife Resources	5.9%
Anadarko	4.3%
Koch Exploration	2.8%
Norcen Energy Ltd.	1.7%
Other	2.6%

PROCESS: Polymer Flood
COST: Capital - $1.3 Million
Operating - $1.15 Million/year
START-UP: June 1987 (commenced continuous polymer injection)
TERMINATION: 1994

DESCRIPTION

PILOT AREA: 194 ha
WELL PATTERN: Irregular pattern
WELL SPACING: 16 ha
NO. OF WELLS:

Injection	2
Production	7
Observation	0

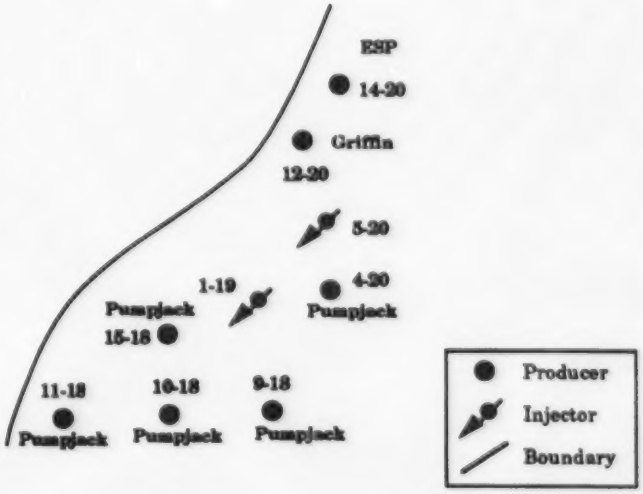
FACILITIES

ARTIFICIAL LIFT METHODS: 5 Pump Jacks, 1 electrical sub pump, 1 pump progressing cavity
TREATER TYPE: C.E. NATCO - dual polarity
STORAGE FACILITIES: Two - 80 m^3 tanks
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Upper Mannville Glauconitic Sandstone
Depth to Top of Formation:	971 m.KB
Reservoir Thickness:	
net:	81 m
gross:	9.0 m
Original Temperature:	35°C
Original Pressure:	10170 kPa
Average Horizontal Permeability:	1140 md
Average Porosity:	22.3%
Average Initial Water Saturation S_w	25%
Average Oil Saturation S_o	initial 75% pore vol.
	current 49.4% pore vol.
Oil Viscosity at Reservoir Temp.	55 mPa.s
Oil Gravity at Reservoir Temp.	900 Kg/m^3
Primary Production Rates:	Max. 25 m^3/well/day
	Avg. 7 m^3/well/day
Source:	Pilot Operator

COMMENTS: Polymer slug is tapered during last 4 years. The scheme is classified as expeimental and encompasses 2/3 of the entire pool in unit 1. Note: The pilot is still operating.



Esso Resources Canada Ltd.

Fisher Creek

LOCATION
LSD 3 Section: 1 Township: 67 Range: 6 W4M

PARTNERS:

Esso Farm in on AEC lands.

PROCESS: Cyclic Steam Stimulation
COST: Capital - $1.3 Million (10 km perm. access road) + $0.5 Million (facilities)
Operating - $0.8 Million (Rental, trucking, etc.)
START-UP: 1986
TERMINATION: Currently on hold, pending completion of production/injection data study.

DESCRIPTION

WELL PATTERN: Single well pilot.
NO. OF WELLS:
Injection/Production - single well pilot

FACILITIES

STEAM GENERATOR(S): Portable equipment used, currently not on site. 31.7 GJ/hr.
ARTIFICIAL LIFT METHODS: Pump-jack 4w co-rod etc.
TREATER TYPE: Atmospheric Treater
STORAGE FACILITIES: Tank Farm
TRANSPORT: Truck - all fluids

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	460 m.KB
Reservoir Thickness: gross:	15-50 m
Original Temperature:	15°C
Original Pressure:	3000 kPa
Average Horizontal Permeability:	700 md
Average Porosity:	29%
Average Water Saturation S_w	0.54-0.68%
Average Oil Saturation S_o	0.46-0.32% pore vol.
Oil Viscosity at Reservoir Temp.	30000-100000 mPa.s
Oil Gravity at Reservoir Temp.	980 Kg/m^3
Source:	Pilot Operator

COMMENTS: Operations suspended August, 1986. Analysis followed and a report was issued February, 1988. No further work is planned at this time.

Esso Resources Canada Ltd.

Leming

LOCATION
Section: 4-8 Township: 65 Range: 3 W4M

PARTNERS:
Esso Resources Canada Ltd. 100%

PROCESS: Cyclic Steam Stimulation, Displacement, Horizontal Wells
COST: Capital - $227 Million
START-UP: January 1975
TERMINATION: On going

DESCRIPTION

PILOT AREA: 1295 ha
WELL PATTERN: Various cluster patterns - see diagram
WELL SPACING: 0.7, 0.8, 0.94, 1.6, 2.9 ha
NO. OF WELLS:

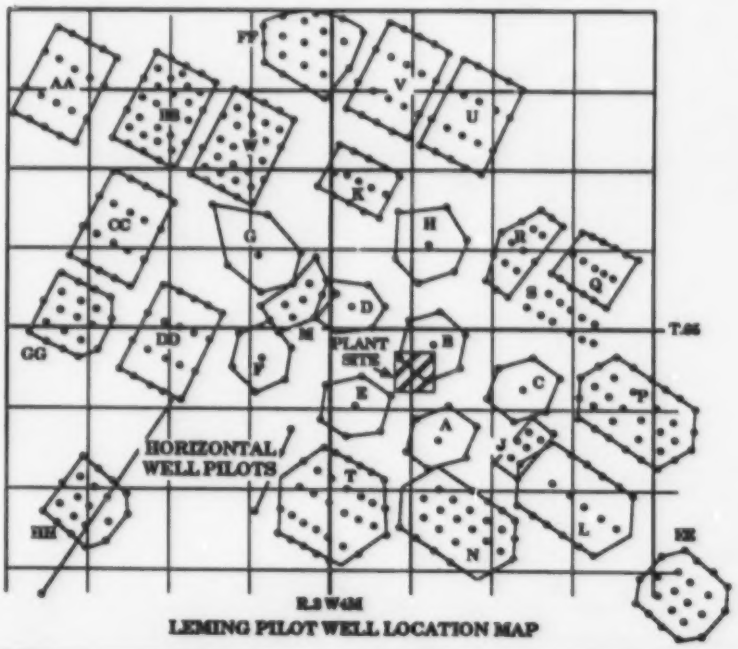
Injection/Production	496
Observation	55

FACILITIES

STEAM GENERATOR(S):
2 - 137.3 GJ/hr. (Produced water)
1 - 156.3 GJ/hr. (Fresh water)
2 - 52.75 GJ/hr. (Fresh water
5 - 42.3 GJ/hr. (Fresh water)
Generator ratings are based on heat input to the water.
ARTIFICIAL LIFT METHODS: Pump Jacks, Hydro-beam, HEP
TREATER TYPE: Electro Static Grid (NATCO)
STORAGE FACILITIES: Tanks
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	440 m.KB
Reservoir Thickness:	
net:	45 m
gross:	50 m
Original Temperature:	13°C
Original Pressure:	3100 kPa
Average Horizontal Permeability:	1500 md
Average Porosity:	35%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	100000 mPa.s
Oil Gravity at Reservoir Temp.	995 Kg/m^3
Source:	Pilot Operator



LEMING PILOT WELL LOCATION MAP

Esso Resources Canada Ltd.

May/Ethel

LOCATION
Section: 22,27,28 Township: 64 Range: 3 W4M

PARTNERS:

Esso Resources Canada Ltd.	100%

PROCESS: Cyclic Steam Stimulation, Displacement and Borehole Mining.
COST: Capital - $70 Million
START-UP: May - 1972
Ethel - 1964 (Abandoned)
TERMINATION: Ongoing

DESCRIPTION

PILOT AREA: 777 ha
WELL PATTERN: See Diagram
WELL SPACING: 1 and 2 ha
NO. OF WELLS:

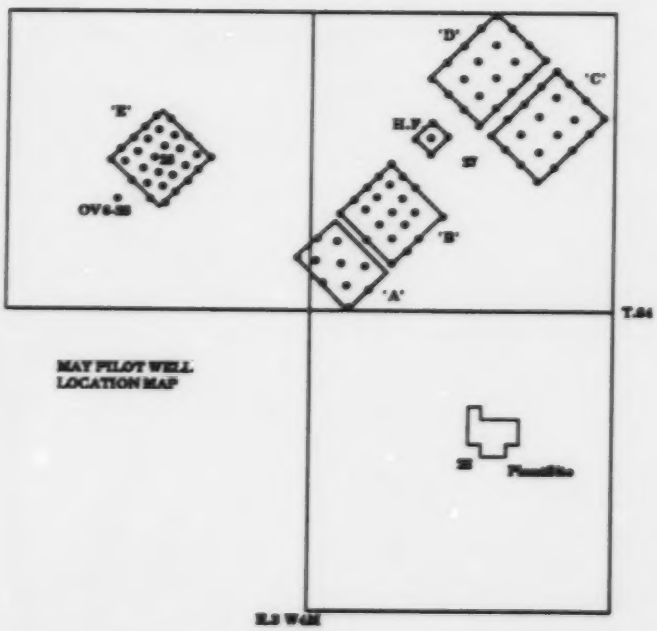
Injection/Production	106
Observation	8

FACILITIES

STEAM GENERATOR(S): 4 - 52.75 GJ/hr, 1 - 26.00 GJ/hr, 1 - 10.60 GJ/hr
ARTIFICIAL LIFT METHODS: Standard Pump Jacks
TREATER TYPE: Electrostatic Grid (NATCO)
STORAGE FACILITIES: Tanks
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	440 m.KB
Reservoir Thickness:	
net:	45 m
gross:	55 m
Original Temperature:	13°C
Original Pressure:	3033 kPa
Average Horizontal Permeability:	1500 md
Average Porosity:	35%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	100000 mPa.s
Oil Gravity at Reservoir Temp.	95 Kg/m^3
Source:	Pilot Operator



Esso Resources Canada Ltd.

Rainbow

LOCATION
LSD 3 Section: 11 Township: 110 Range: 7 W6M

PARTNERS:

Esso Resources Canada Limited	100%

PROCESS: Drainhole in bottom water drive pool.
COST: Capital: 1.32 M$
Operating: 30 K$/year
START-UP: April 9, 1987
TERMINATION: Currently Suspended

DESCRIPTION

PILOT AREA: 65 ha
NO. OF WELLS:

Injection	0
Production	1
Observation	0

FACILITIES

ARTIFICIAL LIFT METHODS: Pump Jack

RESERVOIR

Geological Horizon:	Keg River
Depth to Top of Formation:	1,670 m.KB
Reservoir Thickness:	
net:	19.6 m
gross:	23 m
Original Temperature:	84°C
Original Pressure:	15,620 kPa
Average Horizontal Permeability:	200 md
Average Porosity:	4.5%
Average Water Saturation S_w	22%
Average Oil Saturation S_o	78% pore volume
Oil Gravity at Reservoir Temp.	797 Kg/m^3
Primary Production Rates:	60 m^3/well/day
Source:	Pilot Operator

COMMENTS: This well is currently suspended. The well was unsuccessful as it penetrated an overlying water zone. It is believed that excessive water was produced from the upper most section of the open hole drainhole.

Esso Resources Canada Ltd.

Redwater

LOCATION
LSD All Section: 29 Township: 57 Range: 21 W4M
LSD 4,5,12&13 Section: 28 Township: 57 Range: 21 W4M
LSD 1,2,3,4 Section: 32 Township: 57 Range: 21 W4M
LSD 4 Section: 33 Township: 57 Range: 21 W4M

PARTNERS:
Esso Resources Canada Ltd. 100%

PROCESS: Enriched Hydrocarbon Miscible Flood
COST: (Cumulative to date)
Capital - $4.8 Million
Operating - $13.1 Million
START-UP: January 1985
TERMINATION: January 1994

DESCRIPTION

PILOT AREA: 404.7 ha
WELL PATTERN: 4 inverted 5-spot injection patterns
WELL SPACING: 8.094 ha
PATTERN SPACING: 16.2 ha
NO. OF WELLS:

Injection	4
Observation Well	1
Production (in the injection patterns)	9

16 producers to contain the injection patterns

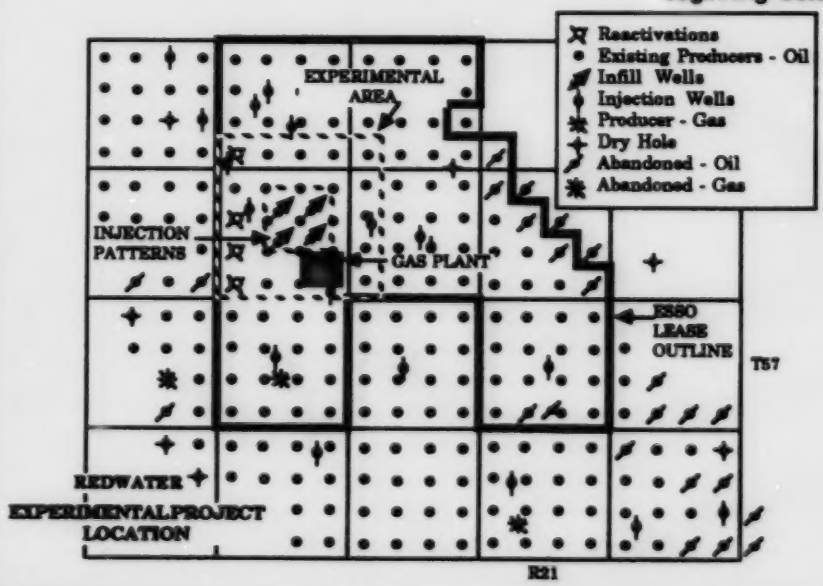
FACILITIES

One gas compressor: 28,000 m^3/d @ 9.7 MPa capacity
ARTIFICIAL LIFT METHODS: Electric Submersible pumps
TRANSPORT: NGL Pipeline

RESERVOIR

Geological Horizon:	Upper Devonian Leduc D3
Depth to Top of Formation:	903 m.KB
Reservoir Thickness: net:	31.39 m
Original Temperature:	34.6°C
Original Pressure:	7450 kPa
Average Horizontal Perm.:	40-200 (Foreslope) md 100-1500 (Backreef) md
Average Porosity:	6%(Backreef) 12% (Foreslope)
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	2.7 mPa.s
Oil Gravity at Reservoir Temp.	844 Kg/m^3
Primary Production Rates:	1-8 m^3/well/day
Source:	Pilot Operator

COMMENTS: The first pattern was flooded beginning October, 1987 for approximately 6 months and the second pattern was flooded in the first half of 1989. Solvent injection into the third of four patterns is scheduled for 1991. Chase gas injection will follow completion of solvent injection into the third pattern.



Home Oil Company Ltd.

Kitscoty

LOCATION
LSD 2,3,4 Section: 2 Township: 51 Range: 2 W4M

PARTNERS:

CS Resources Ltd.	17.5%
Home Oil Company Ltd.	82.5%

PROCESS: Cyclic Steam and Steamflood
COST: Capital - 9 x 10^6 or $10,000,000 for Phase I, II and III
Operating - N/A
START-UP: 1981
TERMINATION: 1992

DESCRIPTION

WELL PATTERN: One five spot and two six spot and 3 single Huff and Puff wells

WELL SPACING: 2 ha

NO. OF WELLS:

Producing thermal wells	13
Producing primary wells	2
Water alternating steam injectors	2
Water disposal well	1
Gas Supply Well	1
Water source well	1

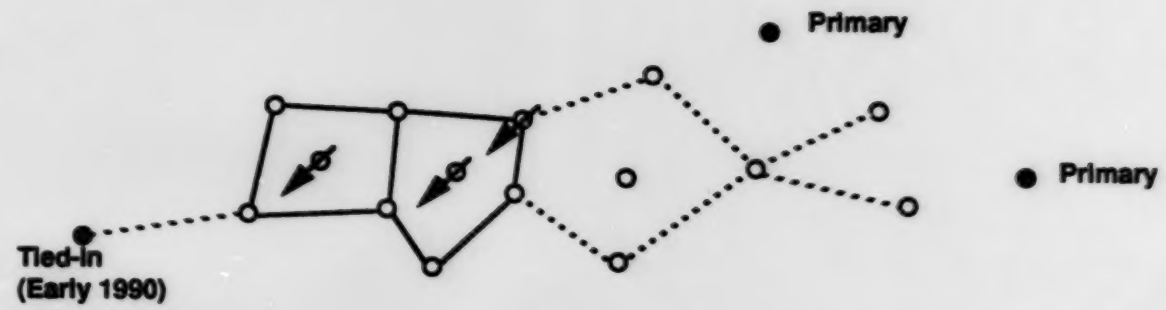
FACILITIES

STEAM GENERATOR(S): one - 26.37 GJ/hr steam generator
STORAGE FACILITIES: Tanks
TRANSPORT: Trucks

RESERVOIR

Geological Horizon:	Sparky Sand
Depth to Top of Formation:	570 m.KB
Reservoir Thickness:	
net:	19 m
gross:	26 m
Original Temperature:	15°C
Original Pressure:	3400 kPa
Average Horizontal Permeability:	2000-3000 md
Average Porosity:	30%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	8000 mPa.s
Oil Gravity at Reservoir Temp.	985 Kg/m^3
Primary Production Rates:	5 m^3/well/day
Source:	Pilot Operator

COMMENTS:
In 1989 Home Oil converted two wells to continuous water/steam injectors. In 1990 another existing thermal well was tied in to the project.



Husky Oil Ltd.

Caribou Lake

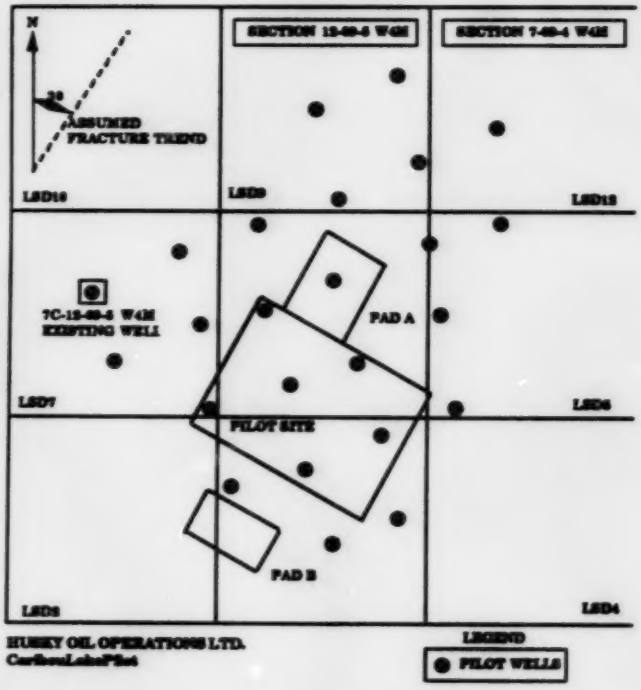
LOCATION
Section: 12 Township: 69 Range: 5 W4M

PARTNERS:
Husky Oil Ltd.
AEC Oil & Gas Company

PROCESS: Cyclic Steam Stimulation
COST: $22 Million
START-UP: March, 1991
TERMINATION: Ongoing

DESCRIPTION

PILOT AREA: 40 ha
WELL PATTERN: elongated, inverted 7-spot
WELL SPACING: 1.6 ha/well
NO. OF WELLS: 25 injection/production wells



FACILITIES

STEAM GENERATOR(S): 1-50 MMBTU/hr
1-25 MMBTU/hr
ARTIFICIAL LIFT METHODS: Conventional Pump Jacks
TREATER TYPE: Horizontal, 3 phase, electrostatic
STORAGE FACILITIES: Lease Tanks
TRANSPORT: Trucking

RESERVOIR

Geological Horizon:	Clearwater B
Depth to Top of Formation:	450 m.KB
Reservoir Thickness:	
net:	22 m
gross:	25 m
Original Temperature:	16°C
Original Pressure:	2800 kPa
Average Horizontal Permeability:	1500 md
Average Porosity:	33%
Average Water Saturation S_w	40%
Average Oil Saturation S_o	60% pore volume
Oil Viscosity at Reservoir Temp.	33,000-69,000 mPa.s
Oil Gravity at Reservoir Temp.	990 Kg/m^3
Source:	Pilot Operator

Husky Oil Operations Ltd.

Kearl Lake

LOCATION

Sections: 9,10,15,16, Township: 95, Range: 7 W4M.

PARTNERS:

*Husky Oil Operations Ltd.	38.25%
Esso Resources Canada Limited	36.75%
AOSTRA	25.00%

* Husky Oil Operations Ltd. acts as agent for Canterra Energy Ltd.

PROCESS: Modified Steam Drive
COST: Capital - $55,000,000
Operating - $79,000,000
START-UP: 1981
TERMINATION: n/a

RESERVOIR

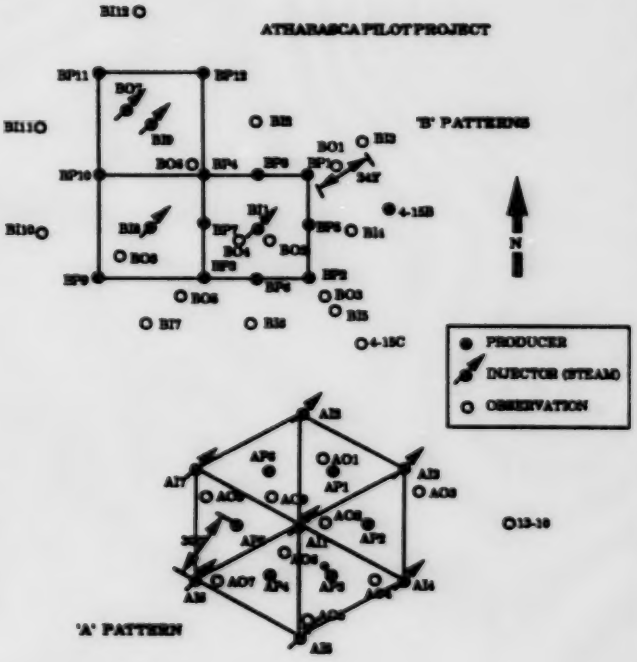
Producing Formation:	McMurray
Depth to Top of Formation:	150 m.KB
Reservoir Thickness:	
net:	40 m
gross:	75 m
Original Temperature:	10°C
Original Pressure:	800 kPa
Average Horizontal Permeability:	2000-6000 md
Average Porosity:	32%
Average Water Saturation S_w	24%
Average Oil Saturation S_o	76%
Oil Viscosity at Reservoir Temp.	2.0 x 10^6 mPa.s
Oil Gravity at Reservoir Temp.	1014 Kg/m^3
Source:	Pilot Operator

DESCRIPTION

PILOT AREA: "A" Pattern 6.4 ha; "B" Pattern 3.24 ha
WELL PATTERN: "A" Pattern - seven-spot
"B" Pattern - five-spot and nine-spot

WELL SPACING: "A" Pattern 0.71 ha; BI1 Pattern 0.27 ha; BI8 & BI9 Patterns 0.54 ha.
NO. OF WELLS:

	"A" Pattern	"B" Pattern
Injection (steam)	7 (7 suspended)	4
Production	6 (3 suspended)	12 (1 suspended)
Observation	9 (3 suspended)	14



FACILITIES

STEAM GENERATORS: Three 53 GJ/hr steam generators
ARTIFICIAL LIFT METHODS: Conventional rod insert pumps.
TREATER TYPE: Field separators and pressure treaters at central facility.
STORAGE FACILITIES: Heated tanks.
TRANSPORT: Trucks.

Koch Exploration Canada Ltd.

Fort Kent

LOCATION
LSD 11 Section: 19 Township: 61 Range: 4 W4M

PARTNERS:

Koch Exploration Canada Ltd.	100%

PROCESS: Cyclic Steam Steam Drive

START-UP: December 13, 1985
TERMINATION: N/A

DESCRIPTION

PILOT AREA: 130 hectares
WELL PATTERN: 5-spot
WELL SPACING: 5 acre
NO. OF WELLS:

Production/injection	27
Water Disposal Well	3
Water Source Well	1

FACILITIES

STEAM GENERATOR(S): one - 30 MM BTU/Hr
one - 50 MM BTU/HR
ARTIFICIAL LIFT METHODS: Bottom Hole Pump
TREATER TYPE: FWKO & Electrostatic Treater
STORAGE FACILITIES: Tanks
TRANSPORT: Husky Pipeline to Lloydminster

RESERVOIR

Geological Horizon:	Upper Grand Rapids
Depth to Top of Formation:	345 m.KB
Reservoir Thickness:	
net:	15 m
gross:	17 m
Original Temperature:	21°C
Original Pressure:	3500 kPa
Average Horizontal Permeability:	2000 md
Average Porosity:	35%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore volume
Oil Viscosity at Reservoir Temp.	30,000 mPa.s
Oil Gravity at Reservoir Temp.	992 Kg/m^3
Source:	Pilot Operator

Mazzei Oil & Gas Ltd.

Frog Lake

LOCATION
Section: 15 Township: 56 Range: 3 W4M

PARTNERS:

Mazzei Oil & Gas Ltd.	50%
AOSTRA	50%

PROCESS: Compare single well steam stimulation vs. electromagnetic oil recovery stimulation
COST: $1 Million
START-UP: January 1988
TERMINATION: 1993

DESCRIPTION
Compare electromagnetic oil recovery process vs. single well Huff and Puff Steam Stimulation
PILOT AREA: Frog Lake
WELL SPACING: 40 acre
NO. OF WELLS: 4

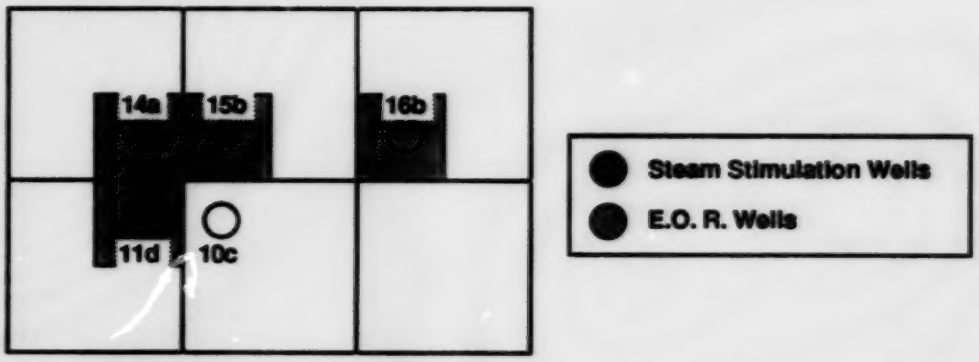
FACILITIES

STEAM GENERATOR(S): Contract out 1 - 22 mill steam generator
ARTIFICIAL LIFT METHODS: Tubing Pump
STORAGE FACILITIES: Four 750 bbl tanks
TRANSPORT: Truck oil to Murphy Blackfoot or BP Chauvin

RESERVOIR

Geological Horizon:	G.P. and Sparky Zones
Depth to Top of Formation:	450-454 m.KB
Reservoir Thickness:	
net:	3 m
gross:	5 m
Original Temperature:	25°C
Original Pressure:	3500 kPa
Average Horizontal Permeability:	4000 md
Average Porosity:	37%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	2500 mPa.s
Oil Gravity at Reservoir Temp.	978 Kg/m^3
Primary Production Rates:	3-7 m^3/well/day
Source:	Pilot Operator

COMMENTS: First cycle of steam averaged 1500 m^3 slug. Second cycles averaged 2500 m^3 slug.



Mobil Oil Canada, Ltd.

Iron River

LOCATION
LSD 11, 12, 13, 14 Section: 6 Township: 64
Range: 4 W4M

PARTNERS:
Mobil Oil Canada, Ltd. 100%

PROCESS: Cyclic Steam Stimulation
COST: $14 Million
START-UP: March 15, 1988
TERMINATION: Approval Expires April 30, 1992

DESCRIPTION

PILOT AREA: 160 acres
WELL PATTERN: See diagram
WELL SPACING: 4 acre; 8 acre
NO. OF WELLS:

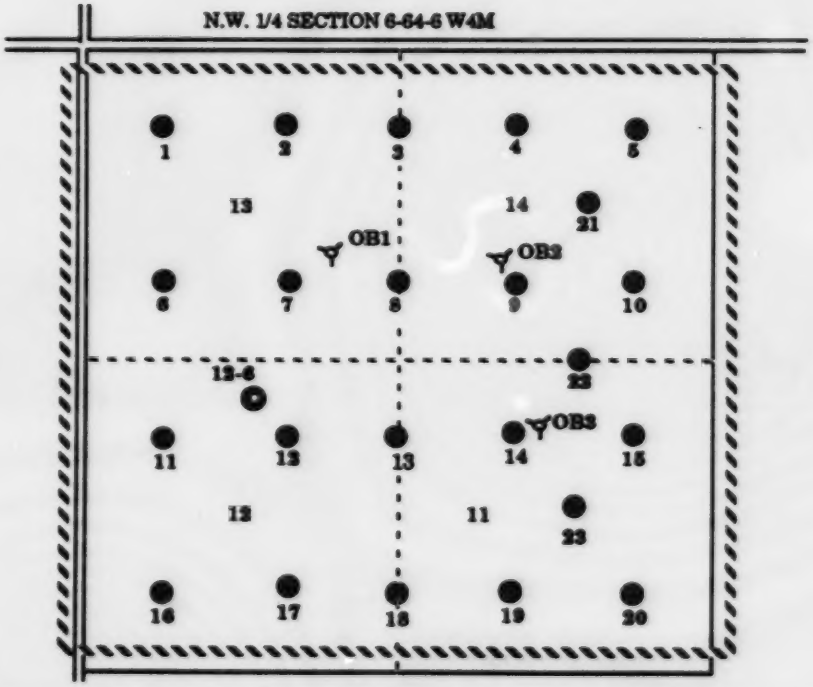
Injectors/Producers	23
Observation Wells	3

FACILITIES
STEAM GENERATOR(S): two - 26 GJ/hr steam generator

ARTIFICIAL LIFT METHODS: Slant and Conventional Pump Jacks, progressive cavity pumps.
TREATER TYPE: Production flowlined to nearby Iron River Battery, with on site treating and water disposal employing a pressure treater.
TRANSPORT: Clean oil is trucked to Husky Tucker Lake terminal.

RESERVOIR

Geological Horizon:	Lower Grand Rapids (Sparky)
Depth to Top of Formation:	360 m.KB
Reservoir Thickness:	
net:	19 m
gross:	27 m
Original Temperature:	15°C
Original Pressure:	3000 kPa
Average Horizontal Permeability:	500-2000 md
Average Porosity:	35%
Average Water Saturation S_w	35%
Average Oil Saturation S_o	65% pore volume
Oil Viscosity at Reservoir Temp.	50,000 mPa.s
Oil Gravity at Reservoir Temp.	988 Kg/m^3
Source:	Pilot Operator



Mobil Oil Canada, Ltd.

Wolf Lake Extension

LOCATION
LSD 11 Section: 17 Township: 64 Range: 6 W4M

PARTNERS:
Mobil Oil Canada, Ltd. 100%

PROCESS: Horizontal well-steam stimulated
START-UP: June 15, 1989
TERMINATION:

DESCRIPTION

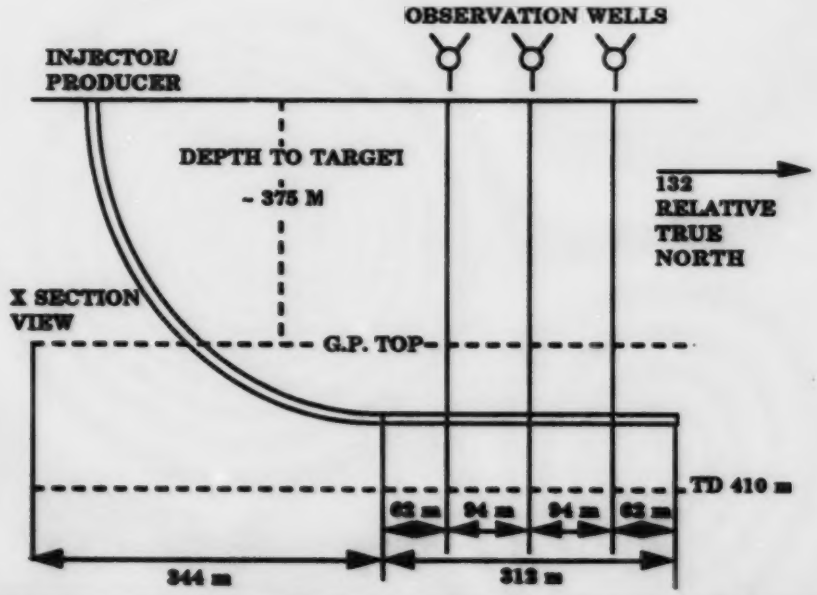
Horizontal well - steam stimulated - with 3 vertical temperature observation wells.
PILOT AREA: ~3 ha
WELL PATTERN: single horizontal well - 300 m
NO. OF WELLS: 4-1 horizontal, 3 vertical

FACILITIES

STEAM GENERATOR(S): 1 - 26 GJ/hr
ARTIFICIAL LIFT METHODS: steam circulation/beam pump
TREATER TYPE: Atmospheric gravity segregation on-site.
STORAGE FACILITIES: six 120 m^3 tanks
TRANSPORT: Trucked to Iron River Facility for treating prior to trucking to Husky Tucker Lake terminal.

RESERVOIR

Geological Horizon:	Lower Grand Rapids - G.P.
Depth to Top of Formation:	375 m
Reservoir Thickness:	
net:	12 m
gross:	17 m
Original Temperature:	15°C
Original Pressure:	3000 kPa
Average Horizontal Permeability:	3 Darcies
Average Porosity:	35%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore volume
Oil Viscosity at Reservoir Temp.	100,000 mPa.s
Oil Gravity at Reservoir Temp.	997 Kg/m^3
Source:	Pilot Operator



Norcen Energy Resources Ltd.

Lindbergh I

LOCATION

LSD 3,4,6,9,16 Section: 13 Township: 55 Range: 6 W4M
LSD 16 Section: 21 Township: 55 Range: 6 W4M
LSD 10 Section: 15 Township: 55 Range: 5 W4M
LSD 06 Section: 21 Township: 55 Range: 5 W4M
LSD 10 Section: 01 Township: 55 Range: 6 W4M
LSD 10 Section: 15 Township: 56 Range: 6 W4M
LSD 14 Section: 01 Township: 56 Range: 6 W4M
LSD 7 Section: 27 Township: 55 Range: 6 W4M
LSD 2 Section: 35 Township: 55 Range: 6 W4M

PARTNERS:

Norcen Energy Resources Ltd.	100%

PROCESS: Cyclic Huff & Puff
COST: $7,300,000
START-UP: May 1982
TERMINATION: Continuing

DESCRIPTION

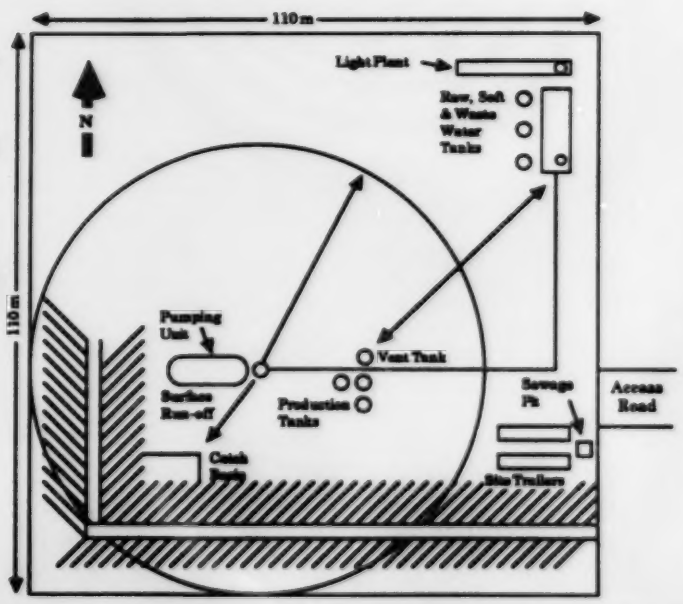
PILOT AREA: 178 ha
WELL PATTERN: Single Well
WELL SPACING: 16 ha
NO. OF WELLS:

Injection/Production	13
Observation	0

FACILITIES

STEAM GENERATOR(S): two - 23.2 GJ/hr steam generators

ARTIFICIAL LIFT METHODS: Conventional Tubing Pump and Pump Jack System
TREATER TYPE: H.T.I.Pump Jack System
STORAGE FACILITIES: 119 m^3 Tanks/Well
TRANSPORT: Trucked to Westmin Cleaning Plant and shipped via Husky pipeline to Lloydminster.



RESERVOIR

Geological Horizon:	Cummings
Depth to Top of Formation:	600 m.KB
Reservoir Thickness:	
net:	12.6 m
gross:	15.0 m
Original Temperature:	24°C
Original Pressure:	3900 kPa
Average Horizontal Permeability:	2400 md
Average Porosity:	30%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	9800 mPa.s
Oil Gravity at Reservoir Temp.	986 Kg/m^3
Primary Production Rates:	5.0 m^3/well/day
Source:	Pilot Operator

COMMENTS: Experimental Operations Continuing at all locations.

Norcen Energy Resources Ltd.

Lindbergh II

LOCATION
LSD 1,2,7,8 Section: 13 Township: 55 Range: 6 W4M

PARTNERS:
Norcen Energy Resources Ltd. 100%

PROCESS: Cyclic Steam Stimulation
COST: Capital -$7,500,000
START-UP: October 1984
TERMINATION: Continuing

DESCRIPTION

PILOT AREA: 64.6 ha
WELL PATTERN: 9-Spot
WELL SPACING: 4.05 ha
NO. OF WELLS:

Injection/Production	16
Observation	0

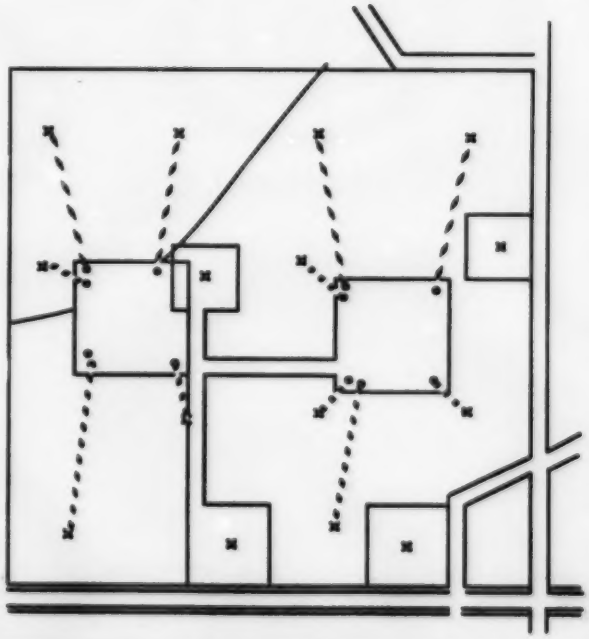
FACILITIES

STEAM GENERATOR(S): one - 52.75 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Conventional Tubing Pump and Pump Jack System
TREATER TYPE: H.T.I. Pump Jack System
STORAGE FACILITIES: two - 150 m^3 tanks
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Cummings
Depth to Top of Formation:	600 m.KB
Reservoir Thickness:	
net:	13.12 m
gross:	15 m
Original Temperature:	24°C
Original Pressure:	3900 kPa
Average Horizontal Permeability:	2838 md
Average Porosity:	25.2%
Average Water Saturation S_w	19.9%
Average Oil Saturation S_o	80.1% pore volume
Oil Viscosity at Reservoir Temp.	9800 mPa.s
Oil Gravity at Reservoir Temp.	986 Kg/m^3
Primary Production Rates:	6.0 m^3/well/day
Source:	Pilot Operator

COMMENTS:
Commissioning of steam generator in May, 1987 with steam injection commenced in June 1987. 13 wells steamed to date.



Norcen Energy Resources Ltd.

Lindbergh III

LOCATION
LSD 11,12,13,14 Section: 13 Township: 55 Range: 6 W4M
PARTNERS:
Norcen Energy Resources Ltd. 100%

PROCESS: Modified Steam Drive
COST: Capital -$6,000,000
START-UP: December 1985
TERMINATION: Continuing

DESCRIPTION

PILOT AREA: 64.6 ha
WELL PATTERN: Inverted 9-Spot with Production Control Wells
WELL SPACING: 4.02 ha/well
NO. OF WELLS:

Injection	1
Production	15
Observation	2

FACILITIES

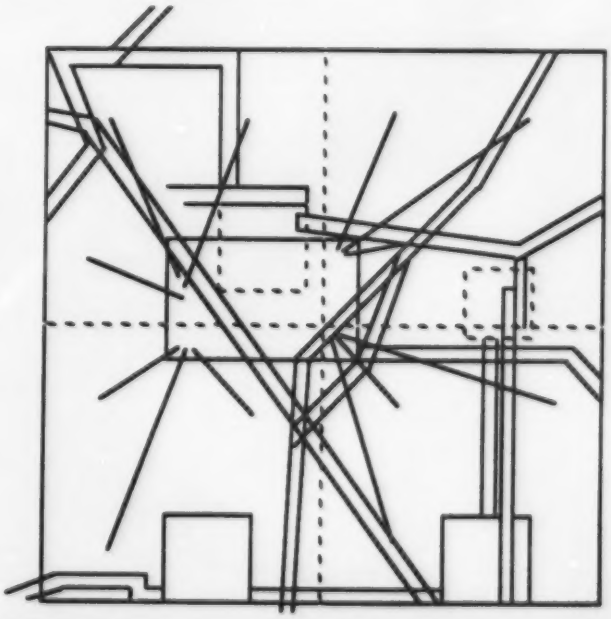
STEAM GENERATOR(S): one - 23.2 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Conventional tubing and pump and pump jack system and progressive cavity pump system.

TREATER TYPE: H.T.I.Pump Jack System
STORAGE FACILITIES: 119 m^3 tanks
TRANSPORT: Trucked to Westmin cleaning plant and shipped via Husky pipeline to Lloydminster.

RESERVOIR

Geological Horizon:	Cummings
Depth to Top of Formation:	600 m.KB
Reservoir Thickness:	
net:	7.31 m
gross:	7.31 m
Original Temperature:	24°C
Original Pressure:	3200 kPa
Average Horizontal Permeability:	3230 md
Average Porosity:	24.7%
Average Water Saturation S_w	20.9%
Average Oil Saturation S_o	79.1% pore volume
Oil Viscosity at Reservoir Temp.	9750 mPa.s
Oil Gravity at Reservoir Temp.	986 Kg/m^3
Primary Production Rates:	6.0 m^3/well/day
Source:	Pilot Operator

COMMENTS: Steam injection commenced in May, 1986 and operation continuing.



Norcen Energy Resources Ltd.

Lloydminster Horizontal Well

LOCATION
LSD 3, 4, & 5 Section: 36 Township: 50 Range: 2 W4M

PARTNERS:
Norcen Energy Resources Ltd.

PROCESS: Horizontal primary production
START-UP: February 1989
TERMINATION: On-going

DESCRIPTION

Lloydminster Horizontal Well - to evaluate productivity improvements and increased recovery of a hozontal well compared to a vertical well.
PILOT AREA: 120 acres special spacing unit (see attached map)
WELL PATTERN: Single well
WELL SPACING: 40 acres
NO. OF WELLS: 1

FACILITIES

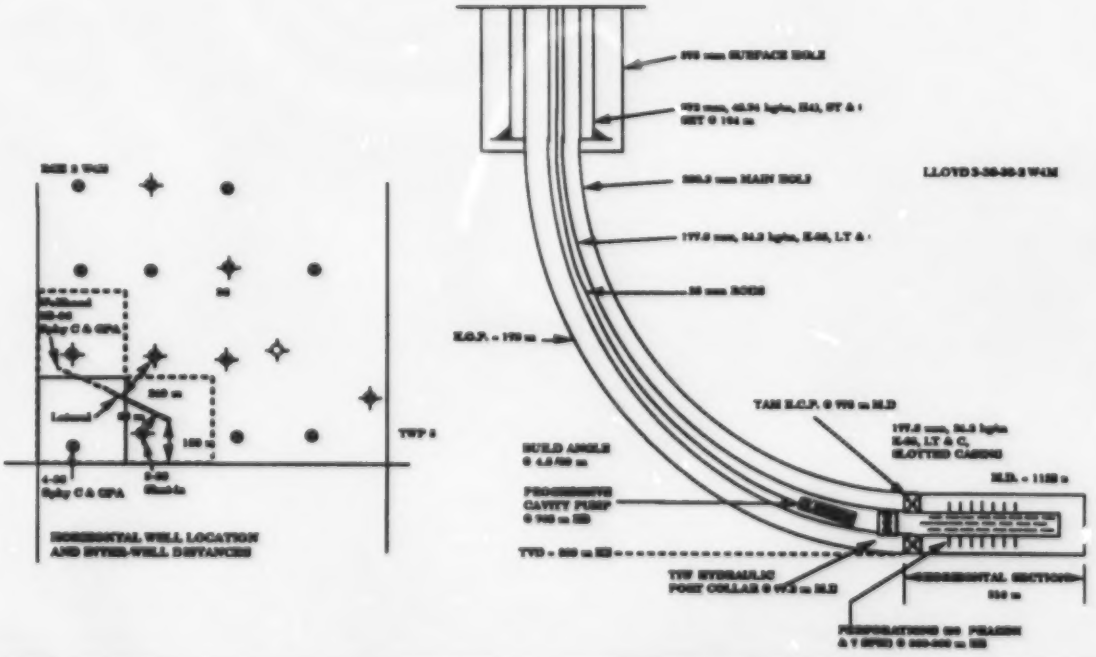
ARTIFICIAL LIFT METHODS: Progressive cavity pump

STORAGE FACILITIES: Lease tank
TRANSPORT: Trucked

RESERVOIR

Geological Formation:	Sparky "B"
Depth to Top of Formation:	585 m
Reservoir Thickness:	
net:	7.5 m
gross:	10.4 m
Original Temperature:	20°C
Original Pressure:	3718 kPa
Average Horizontal Permeability:	1-3 Darcies
Average Porosity:	29%
Average Water Saturation S_w	80%
Average Oil Saturation S_o	20%
Live Oil Viscosity at Reservoir Temp.	2270 mPa.s
Oil Gravity at Reservoir Temp.	967 Kg/m^3
Primary Vertical Production Rates:	5.0 m^3/well/day
Source:	Pilot Operator

COMMENTS: Horizontal well was completed in the middle Sparky which has only 6.0 m net pay. Because of completion problems only 200 m out of the total horizontal section of 300 m is open to the formation.



Norcen Energy Resources Ltd.

Provost (BODO)

LOCATION
LSD 5 Section: 20 Township: 37 Range: 1 W4M
PARTNERS:
Norcen Energy Resources Ltd.
Canadian Occidental Petroleum Ltd.
Murphy Oil Company Ltd.
CS Resources Limited
AOSTRA

PROCESS: Cyclic Steam Stimulation followed by Steamflood.
COST: Capital - $14 MM
Operating - $2.5 MM/Yr.
START-UP: February 1985
TERMINATION: 1992

DESCRIPTION

PILOT AREA: 8 ha
WELL PATTERN: Single Inverted 9-Spot Pattern.
NO. OF WELLS:

Injection	1
Production	8
Observation	3

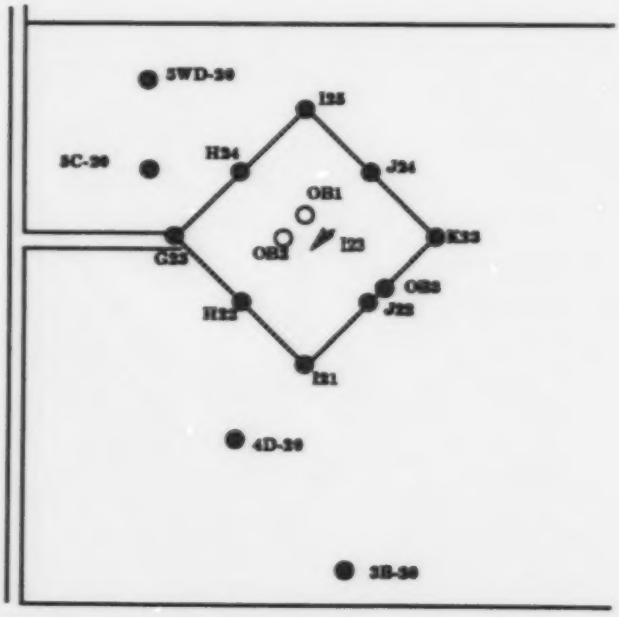
FACILITIES

STEAM GENERATOR(S): one - 26 GJ/hr steam generator

ARTIFICIAL LIFT METHODS: Five HEP Pumping Units and three Le Grand 456 Conventional Pumping Unit.
TREATER TYPE: Complete tank farm and battery with distillation/evaporation type treator.
TRANSPORT: Pipeline to Sales

RESERVOIR

Geological Formation:	McLaren Sand of the Upper Mannville Group
Depth to Top of Formation:	720 m.KB
Reservoir Thickness:	
net:	15 m
gross:	up to 24 m
Original Temperature:	27°C
Original Pressure:	5450 kPa
Average Horizontal Permeability:	1000-5000 md
Average Porosity:	30%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80%
Oil Viscosity at Reservoir Temp.	2300 mPa.s
Oil Gravity at Reservoir Temp.	979 Kg/m^3
Primary Production Rates:	4-5 m^3/well/day
Source:	Pilot Operator



PanCanadian Petroleum Ltd.

Countess B

LOCATION
Section: 16 Township: 29 Range: 16 W4M

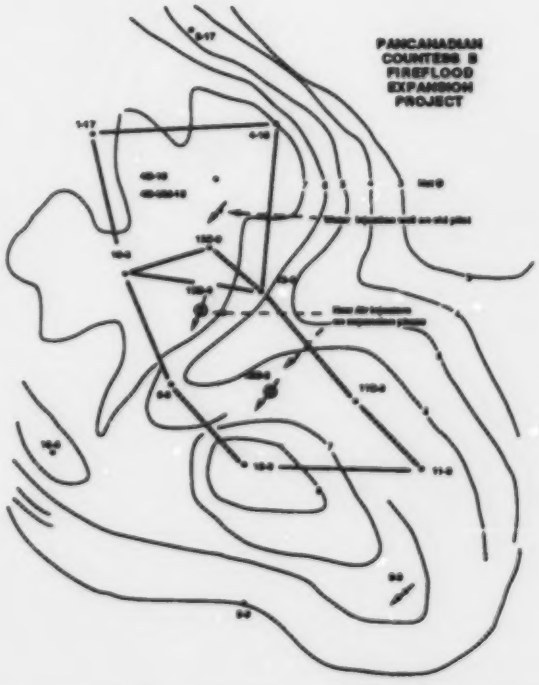
PARTNERS:

PanCanadian Petroleum Ltd.	50%
LL&E	50%
Relative to Licensing Revenue:	
PanCanadian Petroleum Ltd.	45%
LL&E	45%
AOSTRA	10%

PROCESS: Combination Thermal Drive
COST: (original pilot only)
Capital - $4,000,000 to December 31, 1990
Operating - $5,760,000 to December 31, 1990
START-UP: December 1982
TERMINATION: 1990 (air injection only) on original pilot only

DESCRIPTION

PILOT AREA: original: 16.3 ha
2 additional patterns: 30 ha
WELL PATTERN: Inverted 5-Spot



NO. OF WELLS: (Total Project)

Injection Water/Air	1/2
Production	9
Observation/Sampling Well	1
Post Combustion Core Well	1

FACILITIES

COMPRESSOR(S): No. - 2 boosters and one main air compressor - Capacity 56,600 m^3/d @ 24.1 MPa
ARTIFICIAL LIFT METHODS: Sucker Rod Pumps
TREATER TYPE: Horizontal Murdoch HOWG
STORAGE FACILITIES: Oil Production and Shipping Tanks.
TRANSPORT: LACT, BRPL

RESERVOIR

Geological Horizon:	Countess Upper Mannville B
Depth to Top of Formation:	1083 m.KB
Reservoir Thickness: net:	5.8-10.4 m
Original Temperature:	37°C
Original Pressure:	10,000 kPa
Average Horizontal Permeability:	800 md
Average Porosity:	25%
Average Water Saturation S_w	50%
Average Oil Saturation S_o	50% pore volume
Oil Viscosity at Reservoir Temp.	6 mPa.s
Oil Gravity at Reservoir Temp.	887 Kg/m^3
Primary Production Rates:	12 m^3/well/day
Source:	Pilot Operator

COMMENTS: Water injection for heat scavenging started in post combustion core well 4B-UM-16 November 14, 1990. Two additional patterns and 2 new air injectors (13B-9 and 12D-9 added to the south. Also four waterflood producers were converted to fireflood operation in December 1990.

Cumulative combustion gas composition to the end of 1990 as follows (original pilot only)

Nitrogen	=	73.40%
Carbon Dioxide	=	9.90%
Carbon Monoxide	=	0.24%
Oxygen	=	0.67%

Technically successful.

PanCanadian Petroleum Ltd.

Lindbergh - Elk Point

LOCATION
LSD 11 Section: 03 Township: 56 Range: 6 W4M
Lindbergh

PARTNERS:
PanCanadian Petroleum Ltd. 100%

PROCESS: Steamflood Pilot
COST: Capital - $520 M
Operating - $1600/day
START-UP: April 1990 (as per Approval #6099)
TERMINATION: 1991

DESCRIPTION

Steamflood Pilot Project commenced injection in April 1990.
PILOT AREA: 4 ha
WELL PATTERN: inverted 5-spot
WELL SPACING: 4 ha
NO. OF WELLS:

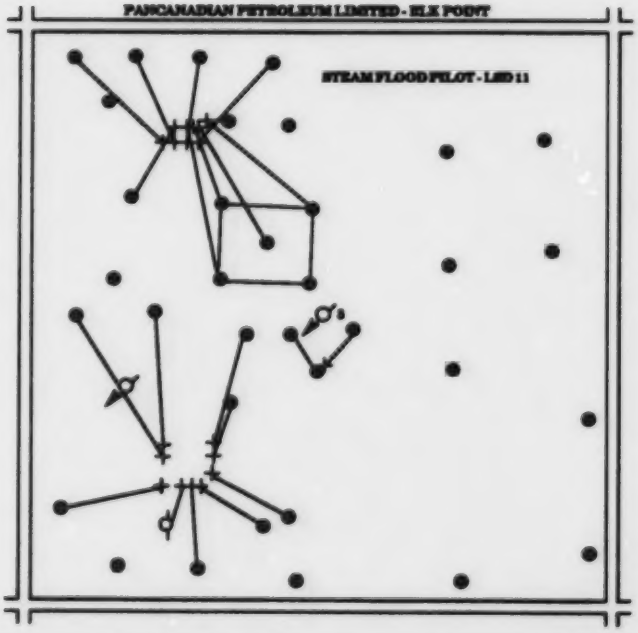
injection	1
production	4

FACILITIES

STEAM GENERATOR(S): one - 25 MMBtu
ARTIFICIAL LIFT METHODS: Screw pump/standard steam and heavy oil sucker rod/jet pump.
STORAGE FACILITIES: Standard stock tanks
TRANSPORT: Truck, LACT

RESERVOIR

Geological Horizon:	Cummings B & C
Depth to Top of Formation:	603 m.KB
Reservoir Thickness:	
net:	13 m
gross:	18 m
Original Temperature:	24°C
Original Pressure:	4400 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	30%
Average Water Saturation S_w	22%
Average Oil Saturation S_o	78% pore volume
Oil Viscosity at Reservoir Temp.	3000 mPa.s
Oil Gravity at Reservoir Temp.	985 Kg/m^3
Primary Prod. Rates:	6 m^3/well/day
Source:	Pilot Operator



Petro-Canada Resources

PCEJ

LOCATION
LSD 1 Section: 34 Township: 84 Range: 11 W4M

PARTNERS:

Petro-Canada Resources	25%
Canadian Occidental Petroleum Ltd.	25%
Esso Resources Canada Ltd.	25%
Japan Canada Oil Sands	25%

PROCESS: Thermal recovery Cyclic Steam
COST: $44.15M
START-UP: May 1990
TERMINATION: March 31, 1992

DESCRIPTION

13 well pilot
PILOT AREA: 20 hectares - 1.5 hectare/well
WELL PATTERN: Line Drive (They also form an enclosed 7 spot pattern)
WELL SPACING: 132 m (1.5 hectares)
NO. OF WELLS: 13 (12 slant and 1 vertical)

FACILITIES

STEAM GENERATOR(S): Two TIW 26000 kg/hr of 80% quality steam
ARTIFICIAL LIFT METHODS: Insert bottomhole pump, Corod and 160-173-86 conventional pump jack
TREATER TYPE: HTI Electrostatic 10' x 60' x 75 psig FWKO 10' x 30' x 90 psig
STORAGE FACILITIES:
Production Tank - One - 64 m^3
Sales Oil tanks - Two - 64 m^3
Produced water skim tank - One - 400 m3
Produced water storage tank - One - 120 m3
Recycle tank - One - 120 m^3
TRANSPORT: Sales oil - Trucking - Suncor Plant

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	280 m.KB
Reservoir Thickness:	
net:	20 m
gross:	35 m
Original Temperature:	10°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	1500 md
Average Porosity:	33%
Average Water Saturation S_w	15%
Average Oil Saturation S_o	85% pore volume
Oil Viscosity at Reservoir Temp.	1,500,000 cp
Oil Gravity at Reservoir Temp.	1014 Kg/m^3
Source:	Pilot Operator

Renaissance Energy Ltd.

Horizontal Well

LOCATION
LSD 11B Section: 21 Township: 20 Range: 8 W4M

PARTNERS:
Renaissance 100%

PROCESS: Horizontal Well
COST: Approximately $500,000
START-UP: June 1989
TERMINATION: January 31, 1994

DESCRIPTION

300 m long horizontal well drilled within 4 m of the top of the Glauc sand, and approximately 12 m above oil/water contact
WELL PATTERN: Standard 10 acre spacing
WELL SPACING: 10 acres
NO. OF WELLS: Two horizontal wells both approximately 300 m long. One 10 acre producer in 11B-21

FACILITIES

ARTIFICIAL LIFT METHODS: High volume rotary pumps
TREATER TYPE: Well is tied into Renaissance Battery at 6-21-20-8 W4M
STORAGE FACILITIES: Standard conventional oil storage and treating facilities
TRANSPORT: Tied into Bow Island Pipeline system

RESERVOIR

Geological Horizon:	Upper Mannville
Depth to Top of Formation:	918.6 m.KB
Reservoir Thickness:	
net:	16.0 m
gross:	35.0 m
Original Temperature:	28°C
Original Pressure:	10410 kPa
Average Horizontal Permeability:	4.0D
Average Porosity:	25%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore volume
Oil Viscosity at Reservoir Temp.	1100 mPa.s
Oil Gravity at Reservoir Temp.	979 Kg/m^3
Primary Production Rates:	50.0 m^3/well/day
Source:	Pilot Operator

Vikor Resources Ltd.

Joffre - Phase II

LOCATION
Section: 24,25,26,34 & 35 Township: 38
Range: 26 W4M
Section: 19 & 30 Township: 38 Range: 25 W4M

PARTNERS:

Vikor Resources Ltd.	45%
Unit Partners	35%
AOSTRA	20%

PROCESS: CO_2 Miscible Flood
COST: Capital - $6,500,000
START-UP: July 1985 - First CO_2 Injection.
Expanded in 1988.
TERMINATION: 1995

DESCRIPTION

PILOT AREA: About 450 ha
WELL PATTERN: Two Truncated Inverted 9-Spots
NO. OF WELLS:

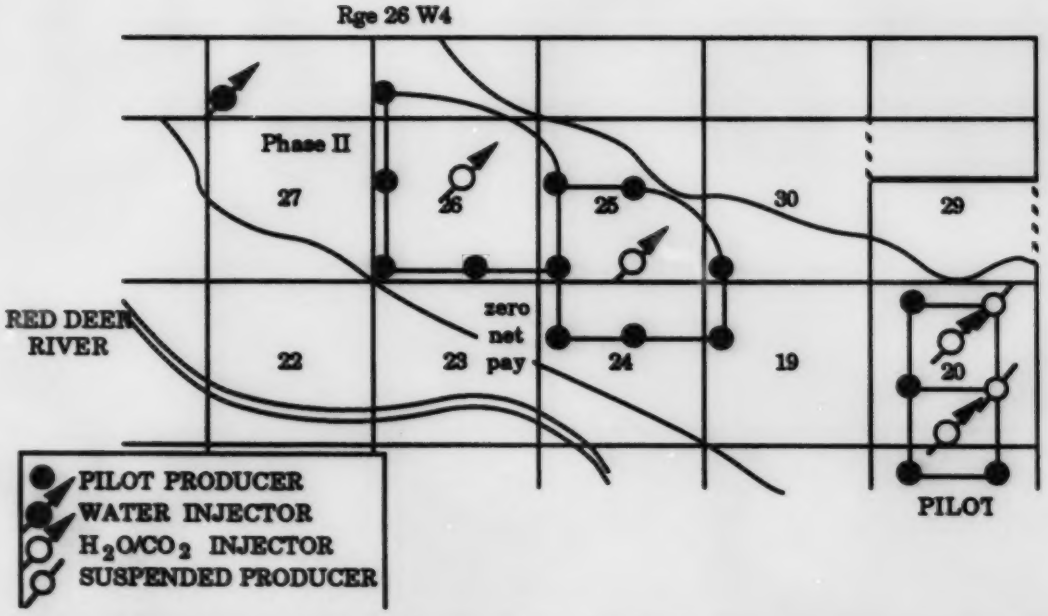
Injection	(water) 1
	(CO_2 + water) 2
Production	11
Observation	0

FACILITIES

Two CO_2 booster compressors - 75,000 m^3/d atmos to 1.0 MPa and injection - 115,000 m^3/d 1.0 to 11 MPa
ARTIFICIAL LIFT METHODS: Conventional subsurface pumps and submersible centrifigal pumps.
TREATER TYPE: 3-phase test and group separators.
TRANSPORT: Crude sales through (LACT) to Gulf's Pipeline

RESERVOIR

Geological Horizon:	Joffre Viking A Sand
Depth to Top of Formation:	1475 m.KB
Reservoir Thickness:	
net:	3 m
gross:	4.5 m
Original Temperature:	56°C
Original Pressure:	7760 kPa
Average Horizontal Permeability:	500 md
Average Porosity:	13%
Initial Water Saturation	30%
Oil Saturation After Waterflood	Approx. 40%
Oil Viscosity at Reservoir Temp.	1-2 mPa.s
Oil Gravity at Reservoir Temp.	813 Kg/m^3
Primary Production Rates:	7 m^3/well/day
Source:	AOSTRA



APPENDIX

RECENTLY TERMINATED PILOT PROJECTS

Alberta Energy Company

Ipiatik Lake Phase A

LOCATION

Section: 1 Township: 73 Range: 6 W4M

PARTNERS:

Alberta Energy Company Limited	60%
Amoco Canada Petroleum Company Ltd.	30%
Deminex (Canada) Limited	10%

PROCESS: Cyclic Steam Stimulation
COST: Capital - $24,000,000 wells/facility/roads
START-UP: Spring 1984
TERMINATION: December 3, 1987

DESCRIPTION

WELL PATTERN: Skewed 7-Spot
WELL SPACING: 1.46 ha/2.44 ha
NO. OF WELLS:

Injection/Production	11
Observation	2

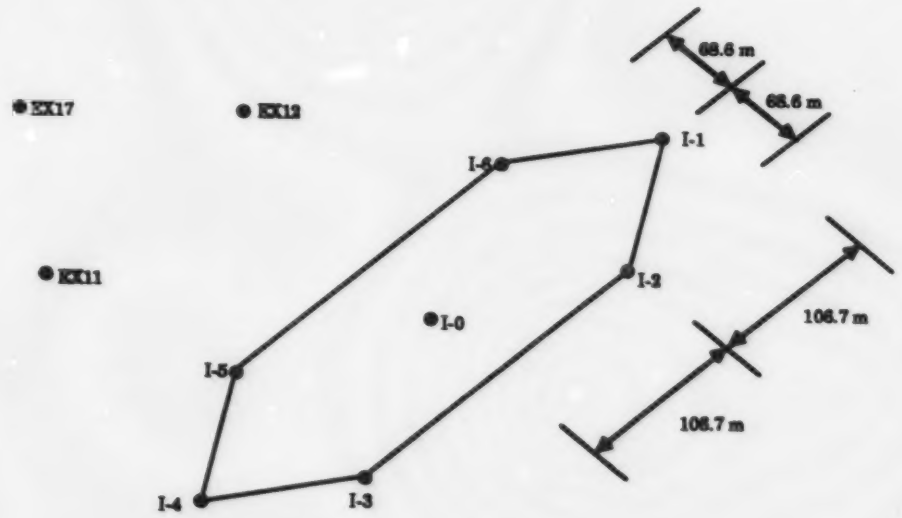
(monitoring temperature via thermocouples)

FACILITIES

STEAM GENERATOR(S): one - 53 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Standard Pump Jacks
TREATER TYPE: Conventional Electrostatic Treater
STORAGE FACILITIES: Field Tanks
TRANSPORT: Rail Transport

RESERVOIR

Geological Horizon:	Wabiskaw
Depth to Top of Formation:	450 m.KB
Reservoir Thickness:	
net:	25 m
gross:	29 m
Original Temperature:	16°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	800 md
Average Porosity:	27%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	45,000 mPa.s
Oil Gravity at Reservoir Temp.	993 Kg/m^3
Source:	Pilot Operator



Alberta Energy Company

Iplatik Lake Phase B

LOCATION

Section: 2 Township: 73 Range: 6 W4M

PARTNERS:

Alberta Energy Company Limited	60%
Amoco Canada Petroleum Company Ltd.	30%
Deminex (Canada) Limited	10%

PROCESS: Cyclic Steam Stimulation
START UP: January 1987
TERMINATION: Suspended January 1, 1990

DESCRIPTION:

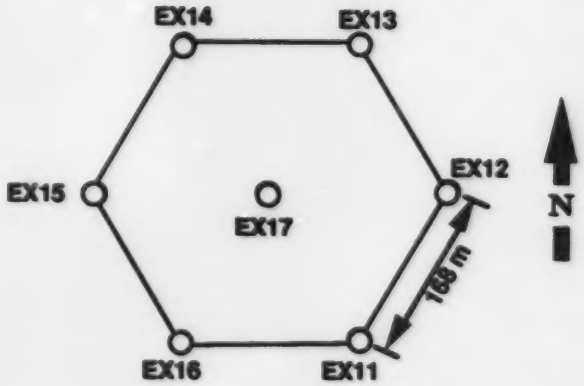
PILOT AREA: 3.7 ha
WELL PATTERN: Regular 7-Spot
WELL SPACING: 2.43 ha
NO. OF WELLS:
Injection/Production 7

FACILITIES

STEAM GENERATOR(S): one - 53 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Standard Pump Jacks
TREATER TYPE: Conventional Electrostatic Treater
STORAGE FACILITIES: Field Tanks
TRANSPORT: Rail Transport

RESERVOIR

Geological Horizon:	Wabiskaw
Depth to Top of Formation:	450 m.KB
Reservoir Thickness:	
net:	25 m
gross:	29 m
Original Temperature:	16°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	800 md
Average Porosity:	27%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	45,000 mPa.s
Oil Gravity at Reservoir Temp.	993 Kg/m^3
Source:	Pilot Operator



Alberta Energy Company

Suffield I

LOCATION

LSD 4 Section: 10 Township: 20 Range: 8 W4M

PARTNERS:

AOSTRA	50%
Alberta Energy Company Ltd.	33.33%
Westcoast Petroleum Company Ltd.	16.66%

PROCESS: Wet Combustion
COST: Capital - $8,989,000 (to Dec. 31/88)
Operating - $7,481,000 (to Dec. 31/88)
START-UP: 1980
TERMINATION: February 1987, termination of wet combustion process. December 1988, termination of blowdown phase.

DESCRIPTION

PILOT AREA: 2 ha
WELL PATTERN: Inverted 5-Spot
WELL SPACING: 1 ha
NO. OF WELLS:

Injection	1 (1 - suspended)
Production	4 (2 - suspended)
Observation	3 (temperature monitoring only) (3 suspended)

FACILITIES

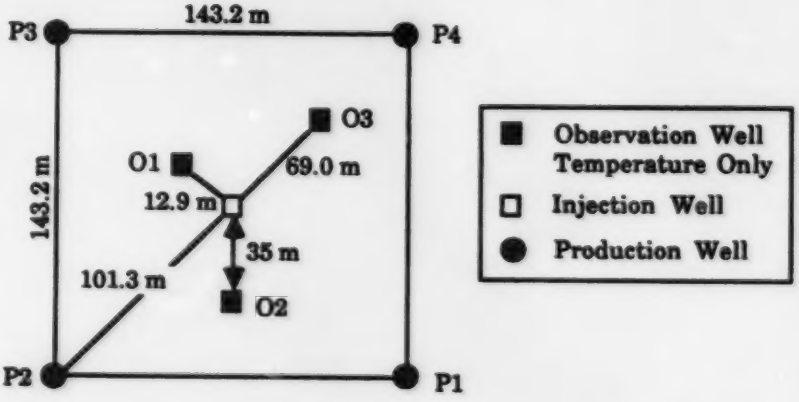
One air compressor - Capacity - 58,000 m^3/d @ 15.9 MPa

ARTIFICIAL LIFT METHODS: Conventional Beam Pump
TREATER TYPE: Pressure Heater-Treater
STORAGE FACILITIES: Oil - 620 m^3, Emulsion - 400 m^3, Water - 620 m^3
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Glauconitic Sandstone
Depth to Top of Formation:	900 m.KB
Reservoir Thickness:	
net:	20 m
gross:	60 m
Original Temperature:	32°C
Original Pressure:	10,275 kPa
Average Horizontal Permeability:	480 md
Average Porosity:	27%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore volume
Oil Viscosity at Reservoir Temp.	850-5000 mPa.s
Oil Gravity at Reservoir Temp.	974-992 Kg/m^3
Primary Production Rates:	1-10 m^3/well/day
Source:	Pilot Operator

COMMENTS: Phase A of Pilot Project completed December 31, 1986. Proceeding with Phase B of project which includes cyclic gas injection scheme, and blowdown of Phase A production wells which is reported separately.



Alberta Energy Company

Suffield II

LOCATION

LSD 11 Section: 34 Township: 19 Range: 8 W4M

PARTNERS:

Alberta Energy Company Limited
Westcoast Petroleum Ltd.
AOSTRA

PROCESS: Gas Injection Slug
START-UP: September 1987
TERMINATION: March 1988

DESCRIPTION

PILOT AREA: 2.86 ha
WELL PATTERN: Inverted 7-Spot
WELL SPACING: 0.9 ha/well
NO. OF WELLS:

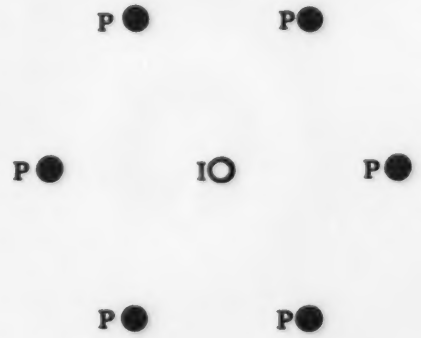
Injection (Common Wellbore)	1
Production	6

FACILITIES

GAS COMPRESSOR(S): one; rental only, Capacity: 14,000 (m^3/d @ 13.5 MPa)
ARTIFICIAL LIFT METHODS: Conventional Beam Pumpjack
TREATER TYPE: Pressure Heater Treater with Colt Evaporator Polisher
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Glauconite Sandstone
Depth to Top of Formation:	899.5 m.KB
Reservoir Thickness:	
net:	32 m
gross:	51 m
Original Temperature:	33°C
Original Pressure:	10515 kPa
Avg. Horizontal Perm.:	500-1000 md
Avg. Porosity:	27%
Avg. Water Saturation S_w	25%
Avg. Oil Saturation S_o	75 pore vol.
Oil Viscosity at Reservoir Temp.	395 mPa.s
Oil Gravity at Reservoir Temp.	970-975Kg/m^3
Primary Production Rates:	1-15 m^3/well/day
Source:	Pilot Operator



Alberta Energy Company

Suffield Hot Water Flood

LOCATION

LSD 12 Section: 3 Township: 20 Range: 8 W4M

PARTNERS:

Alberta Energy Company Limited
Westcoast Petroleum Ltd.
AOSTRA

PROCESS: Hot Water Flood
COST: Capital - $620,000
Operating - $1,124,000
START-UP: 1988
TERMINATION: 1990

DESCRIPTION

PILOT AREA: 0.5 ha
WELL PATTERN: Inverted 4-Spot
WELL SPACING: 65 m
NO. OF WELLS:

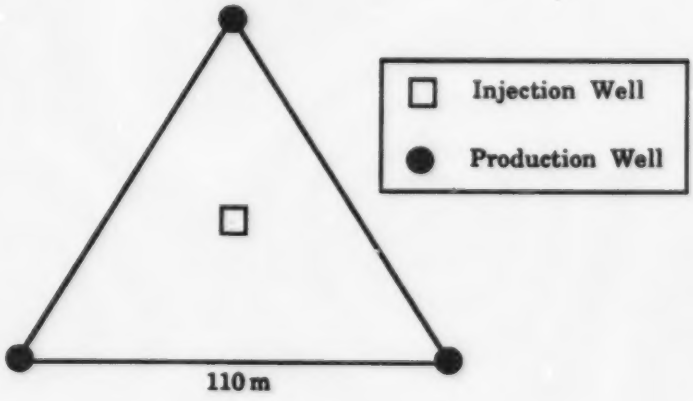
Injection	1
Production	3

FACILITIES

WATER HEATER: Indirect fired line heater (salt bath)
ARTIFICIAL LIFT METHODS: Beam Pump
TREATER TYPE: Produced to Jenner Battery
STORAGE FACILITIES: Central Battery
TRANSPORT: Pipeline

RESERVOIR

Geological Horizon:	Glauconite Sandstone
Depth to Top of Formation:	900 m.KB
Reservoir Thickness:	
net:	33 m
gross:	60 m
Original Temperature:	32°C
Original Pressure:	10275 kPa
Average Horizontal Permeability:	500-1000 md
Average Porosity:	27%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	400 mPa.s
Oil Gravity at Reservoir Temp.	970-975 Kg/m^3
Primary Production Rates:	1-15 m^3/well/day
Source:	Pilot Operator



Amoco Canada Petroleum Company Ltd.
Atlee Buffalo

LOCATION
Section: Township: Range: 5&6 W4M

PARTNERS:
Amoco Canada Petroleum Company Ltd. 100%

PROCESS: Combination Thermal Drive
COST: Capital - $2.8 Million
Operating - $1.5 Million for 1985
START-UP: July 1983
TERMINATION: November 1987 Project shutin due to low oil prices.

DESCRIPTION

PILOT AREA: 240 ha
WELL PATTERN: Two irregular inverted 9-Spot patterns
WELL SPACING: 15 ha/well
NO. OF WELLS:

Injection	2
Production	14
Observation	0

FACILITIES

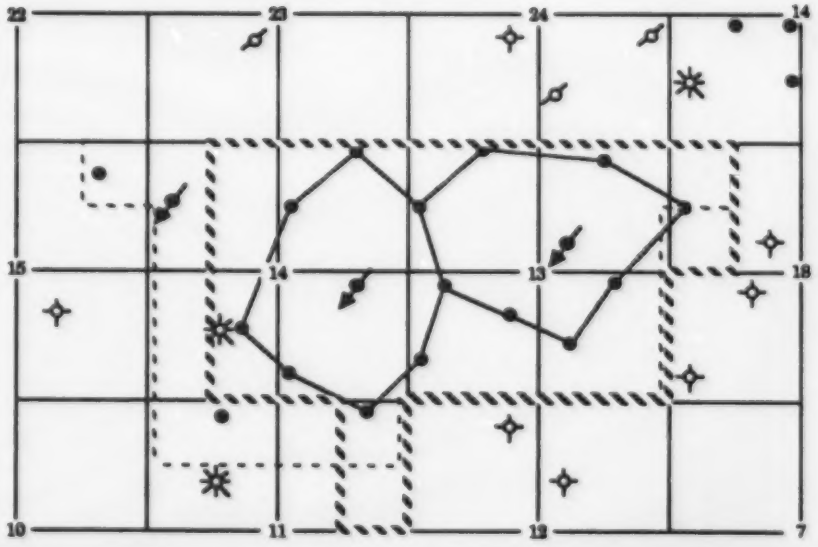
One - 98,600 m^3/d @ 12.4 MPa air compressor
ARTIFICIAL LIFT METHODS: Beam Pumps and Progressive Cavity Pumps

TREATER TYPE: Pressure treater
STORAGE FACILITIES: Oil - 1000 m^3
Water - 160 m^3, Emulsion - 160 m^3
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Glauconite
Depth to Top of Formation:	915 m.KB
Reservoir Thickness: net:	3.7 m
Original Temperature:	30.6°C
Original Pressure:	10300 kPa
Average Horizontal Permeability:	1800 md
Average Porosity:	24%
Average Water Saturation S_w	34%
Average Oil Saturation S_o	66% pore vol.
Oil Viscosity at Reservoir Temp.	310 mPa.s
Oil Gravity at Reservoir Temp.	965 Kg/m^3
Primary Production Rates:	3.2 m^3/well/day
Source:	Pilot Operator

COMMENTS: Air is still being injected into the two patterns at rates of 100 MSCF/day/well.



Amoco Canada Petroleum Company Ltd.
Gregoire Lake - Phase A

LOCATION

LSD 5 Section: 2 Township: 86 Range: 7 W4M

PARTNERS:

AOSTRA	75%
Amoco Canada Petroleum Company Ltd.	12.5%
Petro-Canada Resources	12.5%

PROCESS: Steamflood with additives (CO_2 and/or Naphtha)
COST: Capital - $7,460,000
Operating - $15,275,000 to term
START-UP: May 1985
TERMINATED: December 1989

DESCRIPTION

PILOT AREA: 0.28 ha
WELL PATTERN: Inverted 4-Spot
WELL SPACING: S/B 0.19 ha/well
NO. OF WELLS:

Injection	1
Production	3
Observation	3

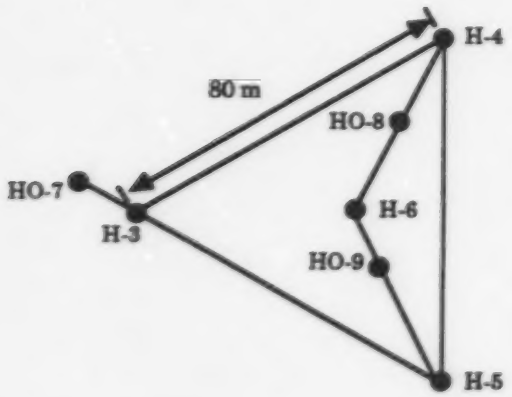
FACILITIES

STEAM GENERATOR(S): one - 26.4 GJ/hr
ARTIFICIAL LIFT METHODS: Conventional Beam Pump
TREATER TYPE: Atmospheric tankage plus diluent
STORAGE FACILITIES: Bitumen/diluent - 400 m^3, Emulsion - 400 m^3, Water - 400 m^3
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	187 m.KB
Reservoir Thickness:	
net:	41 m
gross:	47 m
Original Temperature:	10°C
Original Pressure:	531 kPa
Average Porosity:	36.4%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	850,000 (est) mPa.s
Oil Gravity at Reservoir Temp.	1018 Kg/m^3
Source:	Pilot Operator

COMMENTS:
Steaming operations initiated on October 27, 1986 to heat the production wellbores. A production cycle was started on January 16, 1987.



Distance From H-6
HO-8 25 m
HO-9 15 m

Bow Valley Industries Ltd.
Marie (Cold Lake)

LOCATION

LSD 7 Section: 14 Township: 65 Range: 2 W4M

PARTNERS:

AOSTRA	50%
Bow Valley Industries Ltd.	50%

These are current participating interests. Agreements between the parties provide for changes in interests as the project progresses through different phases.

PROCESS: Cyclic, frac assisted matrix injection scheme initially utilizing superheated steam, CO_2 and other chemical additives.
COST: Capital: $10,205,000
Operating: $17,500,000
START-UP: January 15, 1985 (commencement of cyclic steam) Phase A, January 1987 for Phase AX
TERMINATION: December 31, 1990
August 1, 1990 (field operations terminated).

DESCRIPTION

PILOT AREA: 8.8 ha for 2 patterns
WELL PATTERN: Skewed 7-Spot
WELL SPACING:
Initial Pilot: 0.9 ha spacing
Second Phase: 1.8 ha spacing
NO. OF WELLS:

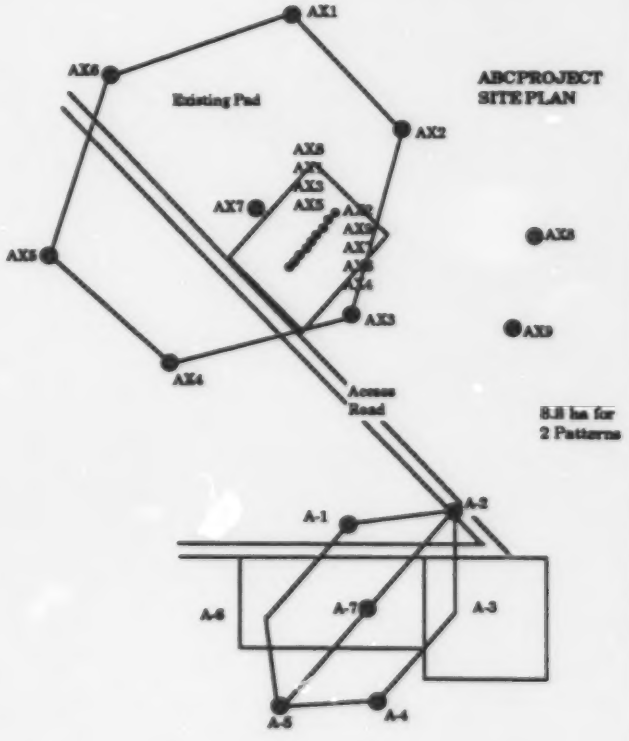
Injection/Production	16
Observation	3

FACILITIES

STEAM GENERATOR(S): two - 94.78 GJ/hr
ARTIFICIAL LIFT METHODS: Rod actuated bottomhole pumps, tubing and conventional pumpjacks
TREATER TYPE: Colt dehydrator
STORAGE FACILITIES:
FWKO = 318 m^3, coalescing tank - 636 m^3, settling tank = 119 m^3, Sales Oil Tank - 795 m^3, waste water skimmer tank - 318 m^3, waste water storage tanks 476 m^3

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	420 m.KB
Reservoir Thickness:	
net:	(C-2 only) 3.5 m
	(C-3 only) 4.0 m
gross:	(C-2 only) 10.0 m
	(C-3 only) 4.0 m
Original Temperature:	11.5°C
Original Pressure:	3450 kPa
Average Horizontal Permeability:	2000 md
Average Porosity:	35%
Average Water Saturation S_w	40%
Average Oil Saturation S_o	60% pore vol.
Oil Viscosity at Reservoir Temp.	500,000 mPa.s
Oil Gravity at Reservoir Temp.	1000 Kg/m^3
Primary Production Rates:	1 m^3/well/day
Source:	AOSTRA



BP Canada

Marguerite Lake Phase A

LOCATION

LSD 8, 9, 16, 5, 12, 13 Section: 7,9 Township: 66 Range: 5 W4M

PARTNERS:

AOSTRA	50%
BP Canada (Operator)	50%

PROCESS: Wet Combustion with O_2

COST: Capital - $20,000,000
Operating - $30,000,000

START-UP: June 1978

TERMINATION: April 1987

DESCRIPTION

PILOT AREA: 20 ha over 4 patterns

WELL PATTERN: Four 5-Spot patterns with subsequent in-fill drilling

WELL SPACING: Initial 2 ha spacing

NO. OF WELLS:

Test area: 3 combustion test wells (1 injector; 2 producers) Main pattern 5 injectors, 16 producers.
1 non-operational well; 12 observation wells: 12 (12 for temperature only; 2 for temperature and pressure)

FACILITIES

STEAM GENERATOR(S): two - 53 GJ/hr

ARTIFICIAL LIFT METHODS: Standard Pump Jack

TREATER TYPE: 8' x 30' Cenatco

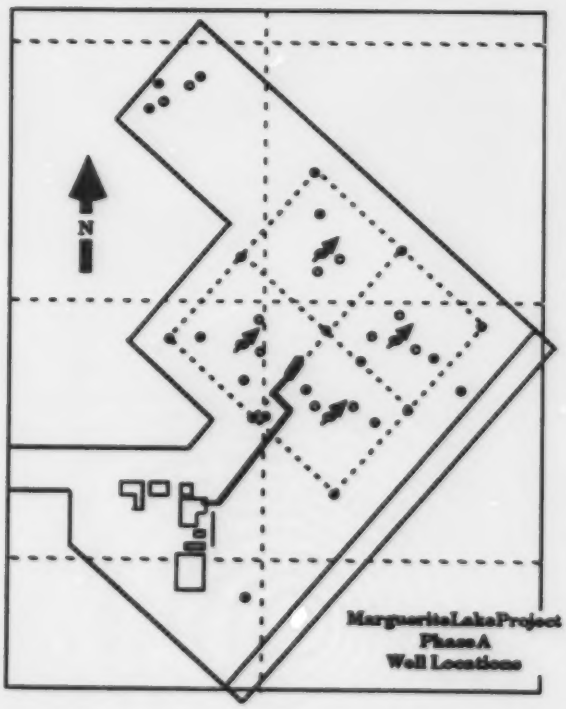
STORAGE FACILITIES: Oil - 499 m^3
Water - 800 m^3

TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	440 m.KB
Reservoir Thickness:	
net:	23 m
gross:	35.4 m
Original Temperature:	16°C
Original Pressure:	2800 kPa
Average Horizontal Permeability:	1150 md
Average Porosity:	31%
Average Water Saturation S_w	35%
Average Oil Saturation S_o	65% pore volume
Oil Viscosity at Reservoir Temp.	100,000 mPa.s
Oil Gravity at Reservoir Temp.	993 Kg/m^3
Source:	AOSTRA

COMMENTS: This project terminated April 1, 1987. New Project (BP/PCI Project Owl) started on same location with new partner.



BP Canada/Petro-Canada Resources
Project Owl

LOCATION

LSD 8,9,16,5,12,13 Section: 7.9 Township: 66 Range: 5 W4M

PARTNERS:

Petro-Canada Resources	50%
BP Canada (Operator)	50%

PROCESS: Wet Combustion with O_2
COST: Capital - $1,000,000
Operating - $7,000,000
START-UP: April 1987
TERMINATION: December 1988

DESCRIPTION

PILOT AREA: 20 ha over 4 patterns
WELL PATTERN: Four 5-Spot patterns with subsequent in-fill drilling
WELL SPACING: Initial 2 ha spacing
NO. OF WELLS:

Injection (oxygen/water)	3
Production	16
Observation (temperature only)	12
(temperature/pressure)	2
Non-Operational	1

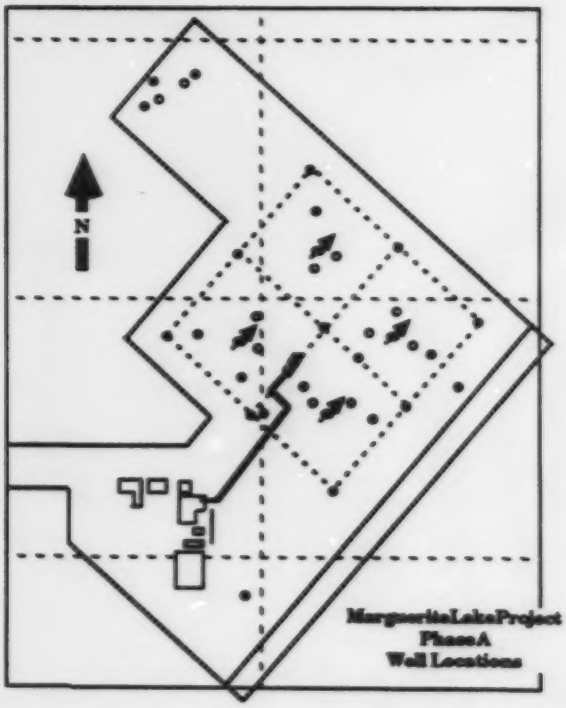
FACILITIES

STEAM GENERATOR(S): two - 53 GJ/hr
ARTIFICIAL LIFT METHODS: Standard Pump Jack
TREATER TYPE: 8' x 30' Cenatco
STORAGE FACILITIES: Oil 3 x 499 m^3
Water - 800 m^3
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	440 m.KB
Reservoir Thickness:	
net:	23 m
gross:	35.4 m
Original Temperature:	16°C
Original Pressure:	2800 kPa
Average Horizontal Permeability:	1150 md
Average Porosity:	31%
Average Water Saturation S_w	35%
Average Oil Saturation S_o	65% pore volume
Oil Viscosity at Reservoir Temp.	100,000 mPa.s
Oil Gravity at Reservoir Temp.	993 Kg/m^3
Source:	Project Operator

COMMENTS: Combustion development continued at Wolf Lake.



Canadian Occidental Petroleum Ltd.
Manatokan

LOCATION

LSD 1/2 Section: 13 Township: 63 Range: 8 W4M

PARTNERS:

Westcoast Petroleum Ltd. (Override royalty)

PROCESS: Huff'n puff/steam drive
COST: Capital $25 MM
START-UP: December 1985
TERMINATION: December 1990 - currently suspended September 1988

DESCRIPTION

PILOT AREA: 48 ha (subsurface - pad drilling)
WELL PATTERN: 12 inverted 5-Spot patterns (4 ha spacing)
WELL SPACING: 2 ha
NO. OF WELLS:

Injection	32
Production	32
Observation	(+ 1 tentative) 1

Note: All wells are steamed then produced.

FACILITIES

STEAM GENERATOR(S): three - 52.76 GJ/hr steam generators
ARTIFICIAL LIFT METHODS: Slant hole conventional
TREATER TYPE: Heater treater and evaporator dehydrator (polishing unit)
STORAGE FACILITIES: four 63.5 m^3 insulated tanks
TRANSPORT: Truck oil to Murphy Blackfoot truck terminal in Lloydminster area.

RESERVOIR

Geological Horizon:	Lower Grand Rapids Formation
Depth to Top of Formation:	370 m.KB
Reservoir Thickness:	
net:	12 m
gross:	22 m
Original Temperature:	20°C
Original Pressure:	3600 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	31%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore vol.
Oil Viscosity at Reservoir Temp.	90000 mPa.s
Oil Gravity at Reservoir Temp.	993 Kg/m^3
Source:	Pilot Operator

Canadian Occidental Petroleum Ltd.
Morgan

LOCATION

LSD 10 Section: 34 Township: 51 Range:4 W4M

PARTNERS:

Canadian Occidental Petroleum Ltd.	100%

PROCESS: Fireflood; ran on cyclic steam, currently on primary.
COST: Capital - $8.2 million
START-UP: February 1986
TERMINATION: February 1991 - Steam suspended July 1988

DESCRIPTION

PILOT AREA: 16 ha
WELL PATTERN: 4, 4 ha inverted 5-Spots
WELL SPACING: 2 ha
NO. OF WELLS:

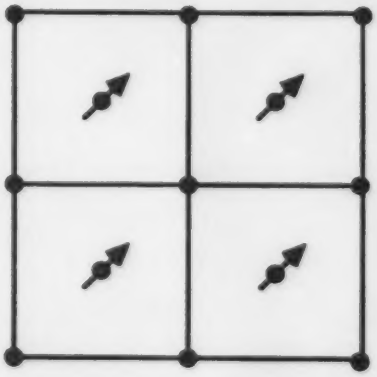
Injection	4
Production	9
Observation	0

FACILITIES

STEAM GENERATOR(S): one - 0.44 GJ/hr steam generator for pre-heat
ARTIFICIAL LIFT METHODS: Hydraulic pumping units; progressive cavity
TREATER TYPE: HTI (electronic) and Cold (distillation) polishing unit
STORAGE FACILITIES: 13 tanks (1684 m^3 total capacity)
TRANSPORT: Husky's Cold Lake Heavy Oil Pipeline (tie-in on site)

RESERVOIR

Geological Horizon:	Lloydminster Formation
Depth to Top of Formation:	570 TVD m.KB
Reservoir Thickness:	
net:	7 TVD m
gross:	11 TVD m
Original Temperature:	23°C
Original Pressure:	3200 kPa
Average Horizontal Permeability:	3000 md
Average Porosity:	28%
Average Water Saturation S_w	25%
Average Oil Saturation S_o	75% pore vol.
Oil Viscosity at Reservoir Temp.	4600 mPa.s
Oil Gravity at Reservoir Temp.	988 Kg/m^3
Primary Production Rates:	2.0 m^3/well/day
Source:	Pilot Operator



CS Resources

Pelican

LOCATION
Section: 3-17 Township: 81 Range: 22 W4M

PARTNERS:

C.S. Resources Ltd	100%
Deuvan Petroleum Ltd.	

PROCESS: Primary Production only
START-UP: 1980 Primary, 1981-1986 Fireflood, 1983-Present Cyclic Steaming
TERMINATION: Pilot Terminated May 1989

DESCRIPTION

PILOT AREA: Post-Combustion Primary, Water and Steam Flood
WELL PATTERN: 9 Inverted 30 Acre 17 Spot Patterns
OUTER PILOT AREA: Primary, Cyclic Steaming, Horizontal wells
WELL PATTERN: Single Wells
WELL SPACING: See Above
NO. OF WELLS:

Vertical Wells	13
Horizontal Wells	13

FACILITIES

ARTIFICIAL LIFT METHODS: Lufkin, Griffin, Corod, EMIP
TREATER TYPE: Atmospheric
STORAGE FACILITIES:
Single Wells - 750 BBl Tanks
Others - Group/Test Tanks
TRANSPORT:
Pilot - Underground to treating facilities
Outer Area - Tank Trucks

RESERVOIR

Geological Horizon:	Wabiskaw - McMurray
Depth to Top of Formation:	400 m.KB
Reservoir Thickness:	
net:	3.5-6.5 m
gross:	6.5 m
Original Temperature:	18°C
Original Pressure:	2375 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	26%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore volume
Oil Viscosity at Reservoir Temp.	800-1200 mPa.s
Oil Gravity at Reservoir Temp.	973 Kg/m^3
Primary Production Rates:	2.8 m^3/well/day
Source:	Pilot Operator

COMMENTS: In Mid-1989, Gulf Canada Resources transferred its 100% ownership in the "Pelican project to C.S. Resources of Calgary. Prior to the transfer, Gulf abandoned the fireflood project and the majority of the single well installations. C.S. Resources retained 12 single wells and the 8 horizontal wells as well as the treating facilities. C.S. Resources have continued to operate the retained facilities in primary production mode only.

Esso Resources Canada Ltd.

Leduc

LOCATION
LSD 8 Section: 17 Township: 50 Range: 26 W4M

PARTNERS:
Esso Resources Canada Ltd.
Leduc Woodbend D-2 Unit

PROCESS: Hydro carbon miscible flood (propane) following brine pre-flush
START-UP: September 1985
TERMINATION: May 1988

DESCRIPTION

WELL SPACING: See plot plan
NO. OF WELLS:

Injection	1
Production	1
Observation	1

FACILITIES

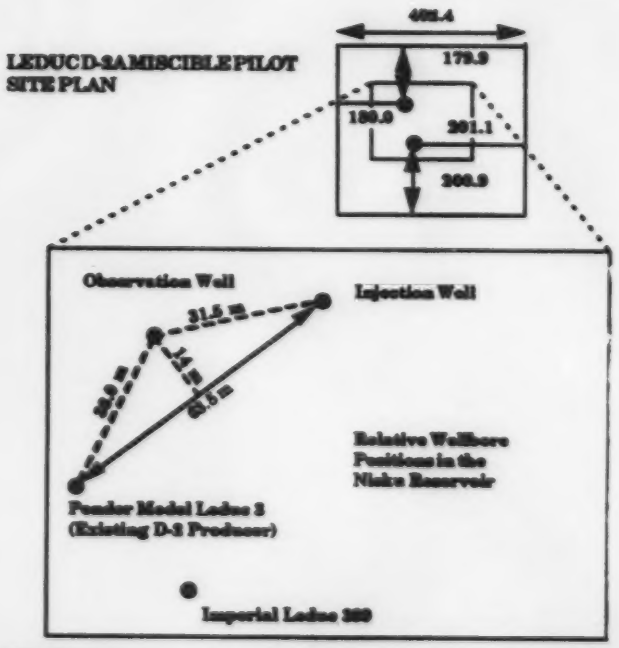
ARTIFICIAL LIFT METHODS: Rod Pump
TREATER TYPE: 3 phase separator
STORAGE FACILITIES: Brine & Propane tanks for Injection

TRANSPORT: Injected fluids are trucked. Produced fluids are transported through existing flowlines.

RESERVOIR

Geological Horizon:	Nisku
Depth to Top of Formation:	1550 m.KB
Reservoir Thickness: gross:	45 m
Original Temperature:	63°C
Original Pressure:	12300 kPa
Average Horizontal Permeability:	10 md
Average Porosity:	3.7%
Average Water Saturation S_w	26%
Average Oil Saturation S_o	34% pore vol.
Oil Viscosity at Reservoir Temp.	0.6 mPa.s
Oil Gravity at Reservoir Temp.	730 Kg/m^3
Primary Production Rates:	30 m^3/well/day
Source:	Pilot Operator

COMMENTS: The pilot is located at 8-17-50-26 W4M and consists of an injector producer pair. One observation well was drilled in October, 1987 and a sponge core taken. The oil saturation was measured by interwell tracer, sponge core and single well tracer. All three methods yielded the same answer.



Excel Energy Inc.

Ardmore

LOCATION
LSD 11,12,13,14 Section: 20 Township: 62 Range: 3 W4M

PARTNERS:

Excel Energy Inc.	65%
Koch Exploration Ltd.	35%

PROCESS: Steam Stimulation/Steam Drive
COST: Operating: $45,000/month
START-UP: September 1, 1975
TERMINATION: July 1, 1989

DESCRIPTION

PILOT AREA: 32.4 ha
WELL PATTERN: 5-Spot pattern
WELL SPACING: 1.02 ha and 2.04 ha/well
NO. OF WELLS:

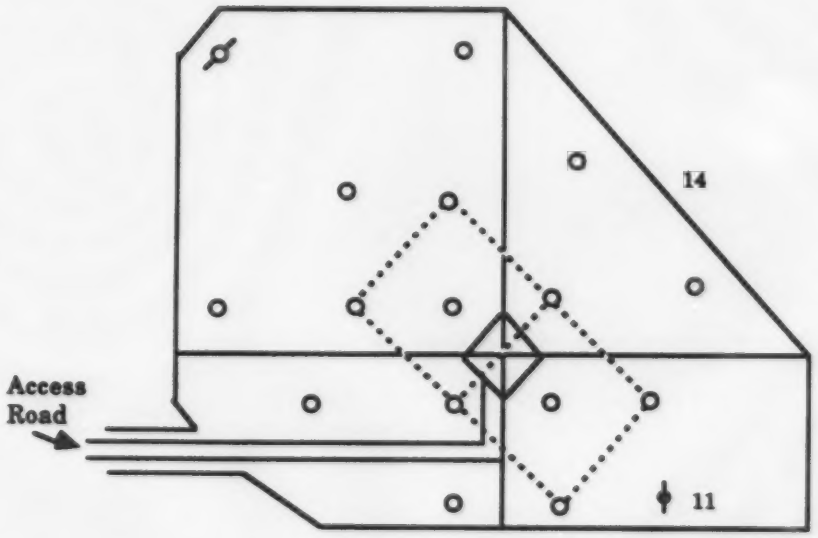
Injection/Production	18
Water disposal	1

FACILITIES

STEAM GENERATOR(S): one - 26 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Conventional Pump Jacks
TREATER TYPE: Atmospheric
STORAGE FACILITIES: Tanks
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Clearwater
Depth to Top of Formation:	375 m.KB
Reservoir Thickness:	
net:	15 m
gross:	40 m
Original Temperature:	15°C
Original Pressure:	2000 kPa
Average Horizontal Permeability:	1500 md
Average Porosity:	30%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore volume
Oil Viscosity at Reservoir Temp.	500,000 mPa.s
Oil Gravity at Reservoir Temp.	1,000 Kg/m^3
Source:	Pilot Operator



Gulf Canada Resources Ltd.

Fenn-Big Valley

LOCATION
LSD 2 Section: 23 Township: 35 Range: 20 W4M

PARTNERS:

Gulf Canada Resources Ltd.
AOSTRA

PROCESS: Nitrogen Injection
COST: $1.6 MM (est.)
START-UP: July 16, 1987
TERMINATION: September 1988 (nitrogen injection)

DESCRIPTION

PILOT AREA: Approximately 30 ha
WELL PATTERN:

The Experimental Scheme is planned and directed toward field testing of two processes never before applied in Alberta:

(a) improved recovery of oil, NGL's and sulphur from a Devonian carbonate reef with nitrogen.

(b) control of fluid interfaces within a Devonian carbonate reef by the injection of nitrogen to optimize oil recovery by an immiscible process.

WELL SPACING: 16 ha
NO. OF WELLS:

Injection	1
Production	1

FACILITIES

ARTIFICIAL LIFT METHODS: Bottom hole pump
TREATER TYPE: None (Wellhead Separator)
TRANSPORT: Satellite gathering system.

RESERVOIR

Geological Horizon:	Leduc (D-3)
Depth to Top of Formation:	1644.1 m.KB
Reservoir Thickness:	
net:	3.81 m
gross:	4.00 m
Original Temperature:	59°C
Original Pressure:	12,510 kPa
Average Horizontal Permeability:	800 (est.) md
Average Porosity:	8.5%
Average Water Saturation S_w	15%
Average Oil Saturation S_o	85% pore volume
Oil Viscosity at Reservoir Temp.	0.8 mPa.s
Oil Gravity at Reservoir Temp.	876 Kg/m^3
Primary Production Rates:	9.0 m^3/well/day
Source:	Pilot Operator

Mobil Oil Canada, Ltd.

Kitscoty

LOCATION

Section: 7, 18, 12, 13 & 14 Township:51
Range: 2 W4M

PARTNERS:
Mobil Oil Canada, Ltd.
Norcen Energy Resources Ltd.
Home Oil Company Ltd.

PROCESS: Thermal drive with water slug.
START-UP: September 1975
TERMINATION: December 1988

DESCRIPTION

PILOT AREA: 420.9 ha
WELL PATTERN: Inverted 7-Spots
WELL SPACING: 4.05 ha
NO. OF WELLS:

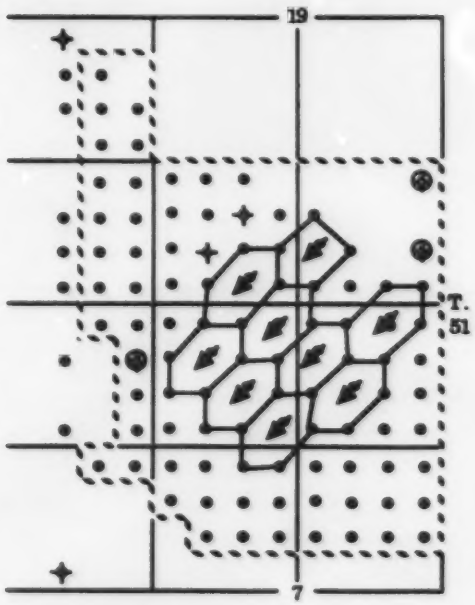
Injection	7
Production	84
Observation	2

FACILITIES
STEAM GENERATOR(S): one air compressor 90.6 x 10^3 m^3/d @ 6.895 MPa

ARTIFICIAL LIFT METHODS: Standard Pump Jacks with some Griffin downhole pumps.
TREATER TYPE: Pressure Treater
STORAGE FACILITIES: Lease tanks and central treating receiving tanks.
TRANSPORT: Husky Pipeline

RESERVOIR

Geological Horizon:	Sparky Sand
Depth to Top of Formation:	548 m.KB
Reservoir Thickness: net:	5 m
Original Temperature:	21°C
Original Pressure:	3450 kPa
Average Horizontal Permeability:	2000 md
Average Porosity:	34%
Average Water Saturation S_w	15%
Average Oil Saturation S_o	85% pore volume
Oil Viscosity at Reservoir Temp.	15,000-40,000 mPa.s
Oil Gravity at Reservoir Temp.	985 Kg/m^3
Primary Production Rates:	1-2 m^3/well/day
Source:	Pilot Operator



Mobil Oil Canada, Ltd.

Wolf Lake

LOCATION
Section: 5, 6, 7, 8 Township: 64 Range: 6 W4M
Also: 21, 27-64-6, 12-64-7, 31, 32-63-6 and 36-63-7

PARTNERS:
Mobil Oil Canada, Ltd. 100%

PROCESS: Cyclic Steam Stimulation
START-UP: May 1982; Several tests added
TERMINATION: December 31, 1990

DESCRIPTION

PILOT AREA: Widely spaced wells.
WELL PATTERN: Individual well steam stimulations
NO. OF WELLS:

Injection/Production	15
Observation	1

(Nine wells currently suspended.)

FACILITIES

STEAM GENERATOR(S): one portable 26 GJ/hr
ARTIFICIAL LIFT METHODS: Conventional tubing pumps.
TREATER TYPE: Produced to wellhead tanks and trucked to recently completed on-site treating and water disposal facilities employing a pressure treater. Clean oil is trucked to the Husky sales terminal at Tucker
TRANSPORT: Trucked

RESERVOIR

Geological Horizon:	Upper & Lower Grand Rapids
Depth to Top of Formation:	UGR 310-350 m.KB LGR 340-380 m.KB
Reservoir Thickness:	
net:	UGR 0-10 m LGR 10-30 m
gross:	UGR 20-60 m LGR 60-80 m
Original Temperature:	15°C
Original Pressure:	3200 kPa
Average Horizontal Permeability:	1000-4000 md
Average Porosity:	35%
Average Water Saturation S_w	38%
Average Oil Saturation S_o	62% pore volume
Oil Viscosity at Reservoir Temp.	20,000-100,000 mPa.s
Oil Gravity at Reservoir Temp.	1000-986 Kg/m^3 (10-12°API)
Source:	Pilot Operator

Murphy Oil Company Ltd.

Lindbergh

LOCATION
LSD 6 Section: 13 Township: 58 Range: 5 W4M

PARTNERS:

Murphy Oil Company Ltd.	100%

PROCESS: Cyclic Steam Stimulation
COST: Capital - $7 MM
Operating - $2.5 MM/Yr.
START-UP: 1974
TERMINATION: December 31, 1990

DESCRIPTION

PILOT AREA: 20.23 ha
WELL PATTERN: Elongated 7-Spot
WELL SPACING: 2.02 ha
NO. OF WELLS:

Injection/Production	16
Observation	0

FACILITIES

STEAM GENERATOR(S): one - 21 GJ/hr steam generator and one - 53 GJ/hr steam generator
ARTIFICIAL LIFT METHODS: Insert Pumps
TREATER TYPE: Murphy Evaporation Dehydrator
STORAGE FACILITIES: Tied into commercial expansion.
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Lower Grand Rapids
Depth to Top of Formation:	510 m.KB
Reservoir Thickness:	
net:	20 m
gross:	20 m
Original Temperature:	21°C
Original Pressure:	2700 kPa
Average Horizontal Permeability:	2500 md
Average Porosity:	33%
Average Water Saturation S_w	18%
Average Oil Saturation S_o	82% pore volume
Oil Viscosity at Reservoir Temp.	100,000 mPa.s
Oil Gravity at Reservoir Temp.	990 Kg/m^3
Source:	Pilot Operator

COMMENTS: Murphy Oil Company Ltd. has applied to ERCB to include the Lindbergh Experimental Pilot Project into the Lindbergh Phase I Commercial Project.

Pilot project approval expired on December 31, 1990.

Murphy Oil Company Ltd.

Morgan

LOCATION
LSD 11 Section: 2 Township: 52 Range: 4 W4M

PARTNERS:

Murphy Oil Company Ltd.	100%

PROCESS: Cyclic Steam Stimulation
COST: Operating - $0.2 MM/Yr.
START-UP: September 1985
TERMINATION: September 30, 1988

DESCRIPTION

PILOT AREA: 4 ha
WELL PATTERN: Single Well
NO. OF WELLS:

Injection	1
Production	1
Observation	0

FACILITIES

STEAM GENERATOR(S): Portable Rental
ARTIFICIAL LIFT METHODS: Insert Pump
TREATER TYPE: None
STORAGE FACILITIES: Two 120 m^3 tanks
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	Lloydminster A
Depth to Top of Formation:	574 m.KB
Reservoir Thickness:	
net:	13 m
gross:	13 m
Original Temperature:	21°C
Original Pressure:	3450 kPa
Average Horizontal Permeability:	1800 md
Average Porosity:	33%
Average Water Saturation S_w	30%
Average Oil Saturation S_o	70% pore volume
Oil Viscosity at Reservoir Temp.	14,500 mPa.s
Oil Gravity at Reservoir Temp.	994 Kg/m^3
Primary Production Rates:	1.75 m^3/well/day
Source:	Pilot Operator

COMMENTS: Pilot approval expired on September 30, 1988.

PanCanadian Petroleum Ltd.

Lindbergh

LOCATION
Section: 07 Township: 55 Range: 5 W4M
Section: 03 Township: 56 Range: 6 W4M

PARTNERS:
PanCanadian Petroleum Ltd. 100%

PROCESS: Cyclic Steam Stimulation
COST: Capital - $60,000/well (est.)
Operating - $150,000/well/yr.
START-UP: September 1983 (as per Approval No. 3886)
TERMINATION: 1990

DESCRIPTION

WELL SPACING: 4 ha - 16 ha
NO. OF WELLS:
Injection/Production 18

FACILITIES

STEAM GENERATOR(S): one - 25 MMBtu
ARTIFICIAL LIFT METHODS: Standard steam and heavy oil sucker rod pump/screw pump.
STORAGE FACILITIES: Standard stock tanks
TRANSPORT: Truck, LACT Unit

RESERVOIR

Geological Horizon:	Cummings B & C
Depth to Top of Formation:	580 m.KB
Reservoir Thickness:	
net:	9 (Sec. 7) 12 (Sec. 3) m
gross:	12 (Sec. 7) 18 (Sec. 3) m
Original Temperature:	24°C
Original Pressure:	4400 kPa
Average Horizontal Permeability:	1000 md
Average Porosity:	30%
Average Water Saturation S_w	20%
Average Oil Saturation S_o	80% pore volume
Oil Viscosity at Reservoir Temp.	3000 mPa.s
Oil Gravity at Reservoir Temp.	986 Kg/m^3
Primary Prod. Rates:	2 (Sec. 7) m^3/well/day
	6 (Sec. 3) m^3/well/day
Source:	Pilot Operator

Petro-Canada Resources

Hangingstone I

LOCATION
LSD 13 Section: 27 Township: 84 Range: 11 W4M

PARTNERS:

Petro-Canada Resources	25%
Canadian Occidental Petroleum Ltd.	25%
Esso Resources Canada Ltd.	25%
Japan Canada Oil Sands	25%

PROCESS: Cyclic Steam Stimulation
START-UP: February 1, 1985
TERMINATION: January, 1988

DESCRIPTION

PILOT AREA: Single Well Test

FACILITIES

STEAM GENERATOR(S): one - 26 GJ/hr portable steam generator
ARTIFICIAL LIFT METHODS: Standard Pump Jack
TREATER TYPE: Atmospheric Treating Tank
STORAGE FACILITIES: Tank Farm on Site
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	261 m.KB
Reservoir Thickness:	
net:	43 m
gross:	51 m
Original Temperature:	15°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	1350 md
Average Porosity:	32%
Average Water Saturation S_w	17%
Average Oil Saturation S_o	83% pore volume
Oil Viscosity at Reservoir Temp.	800,000 mPa.s
Oil Gravity at Reservoir Temp.	1008 Kg/m^3
Source:	Pilot Operator

Petro-Canada Resources

Hangingstone II

LOCATION
LSD 16 Section: 27 Township: 84 Range: 11 W4M

PARTNERS:

Petro-Canada Resources	25%
Canadian Occidental Petroleum Ltd.	25%
Esso Resources Canada Ltd.	25%
Japan Canada Oil Sands	25%

PROCESS: Cyclic Steam Stimulation
START-UP: October 1986
TERMINATION: March, 1990

DESCRIPTION

PILOT AREA: Single Well Test

FACILITIES

STEAM GENERATOR(S): one - 26 GJ/hr portable steam generator
ARTIFICIAL LIFT METHODS: Standard Pump Jack
TREATER TYPE: Atmospheric Treating Tank
STORAGE FACILITIES: Tank Farm on Site
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	261 m.KB
Reservoir Thickness:	
net:	26 m
gross:	51 m
Original Temperature:	15°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	1350 md
Average Porosity:	32%
Average Water Saturation S_w	17%
Average Oil Saturation S_o	83% pore volume
Oil Viscosity at Reservoir Temp.	800,000 mPa.s
Oil Gravity at Reservoir Temp.	1008 Kg/m^3
Source:	Pilot Operator

Petro-Canada Resources

Hangingstone III

LOCATION
LSD 4 Section: 35 Township: 84 Range: 11 W4M

PARTNERS:

Petro-Canada Resources	25%
Canadian Occidental Petroleum Ltd.	25%
Esso Resources Canada Ltd.	25%
Japan Canada Oil Sands	25%

PROCESS: Cyclic Steam Stimulation
START-UP: January 1987
TERMINATION: December 1989

DESCRIPTION

PILOT AREA: Single Well Test

FACILITIES

STEAM GENERATOR(S): one - 26 GJ/hr portable steam generator
ARTIFICIAL LIFT METHODS: Standard Pump Jack
TREATER TYPE: Atmospheric Treating Tank
STORAGE FACILITIES: Tank Farm on Site
TRANSPORT: Truck

RESERVOIR

Geological Horizon:	McMurray
Depth to Top of Formation:	263 m.KB
Reservoir Thickness:	
net:	17 m
gross:	35 m
Original Temperature:	15°C
Original Pressure:	2200 kPa
Average Horizontal Permeability:	1350 md
Average Porosity:	32%
Average Water Saturation S_w	15%
Average Oil Saturation S_o	85% pore volume
Oil Viscosity at Reservoir Temp.	800,000 mPa.s
Oil Gravity at Reservoir Temp.	1008 Kg/m^3
Source:	Pilot Operator

Petro-Canada Resources

Viking-Kinsella B

LOCATION
LSD 2 Section: 24 Township: 48 Range: 9 W4M

PARTNERS:

Petro-Canada Resources	41%
PanCanadian Petroleum Ltd.	8%
Dome Petroleum Ltd.	1%
AOSTRA	50%

PROCESS: Oxygen In Situ Combustion
COST: N/A
START-UP: January 1984
TERMINATION: December 1987

DESCRIPTION

PILOT AREA: 8 ha
WELL PATTERN: Inverted 5-Spot
WELL SPACING: 4 ha
NO. OF WELLS:

Injection	1
Production	4
Observation	2

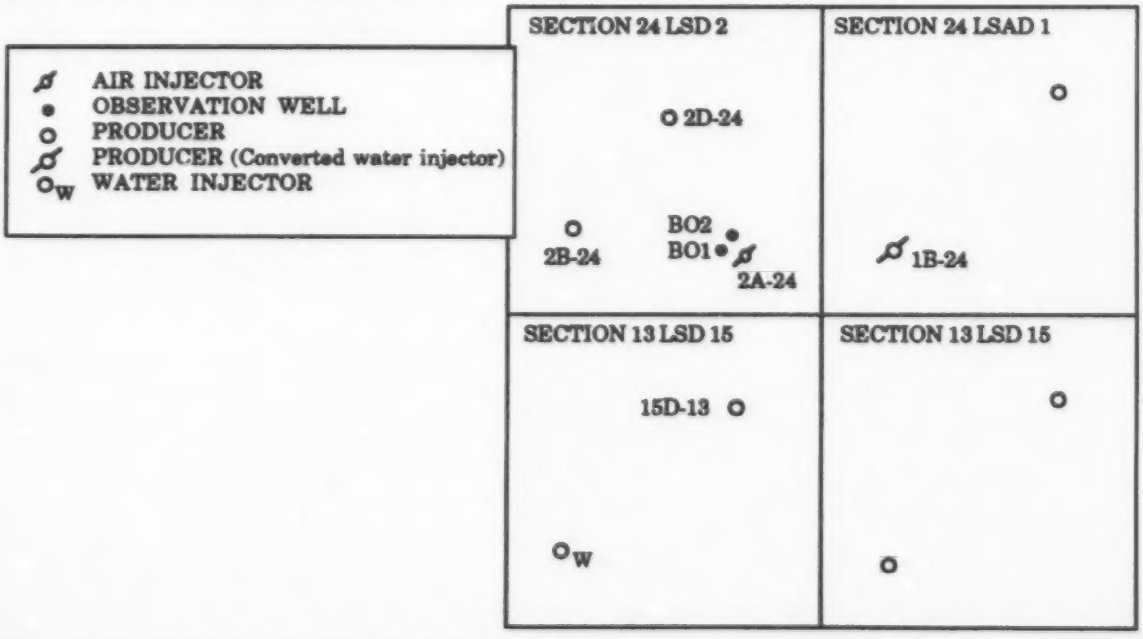
TREATER TYPE: Production to existing Kinsella B Battery
STORAGE FACILITIES: Production to existing Kinsella B Battery
TRANSPORT: Battery production shipped via pipeline.

RESERVOIR

Geological Horizon:	Sparky
Depth to Top of Formation:	652 m.KB
Reservoir Thickness:	
net:	4.0 m
gross:	5.0 m
Original Temperature:	28°C
Original Pressure:	5030 kPa
Average Horizontal Permeability:	200 md
Average Porosity:	30%
Average Water Saturation S_w	33%
Average Oil Saturation S_o	67% pore volume
Oil Viscosity at Reservoir Temp.	100 mPa.s
Oil Gravity at Reservoir Temp.	934 Kg/m^3
Source:	Pilot Operator

FACILITIES

ARTIFICIAL LIFT METHODS: Insert Pumps



Signalta Resources Limited

Pembina - Lobstick

LOCATION
LSD 16 Section: 1 Township: 51 Range: 7 W5M

PARTNERS:
Signalta Resources Limited

PROCESS: Foam-forming surfactant with lean gas injection.
START-UP: October 1986
TERMINATION: May 10, 1990

DESCRIPTION

PILOT AREA: 896 ha
WELL PATTERN: 64 ha
WELL SPACING: 64 ha
NO. OF WELLS:

Injection	1
Production	13
Observation	0

FACILITIES

ARTIFICIAL LIFT METHODS: Standard beam pumping unit. Two wells naturally flowing.
TREATER TYPE: Vertical (Installed 1989)
STORAGE FACILITIES: Tankage
TRANSPORT: Trucked to sales.

RESERVOIR

Geological Horizon:	Ostracod
Depth to Top of Formation:	1725 m.KB
Reservoir Thickness:	
net:	1.0 m
gross:	1.0 m
Original Temperature:	57°C
Original Pressure:	15,410 (abs) kPa
Average Horizontal Permeability:	70 md
Average Porosity:	12%
Average Water Saturation S_w	22%
Average Oil Saturation S_o	78% pore volume
Oil Viscosity at Reservoir Temp.	0.35 mPa.s
Oil Gravity at Reservoir Temp.	797 Kg/m^3
Primary Production Rates:	25 m^3/well/day
Source:	Pilot Operator

COMMENTS: Initial reservoir conditions.

Ulster Petroleums Ltd.

Retlaw

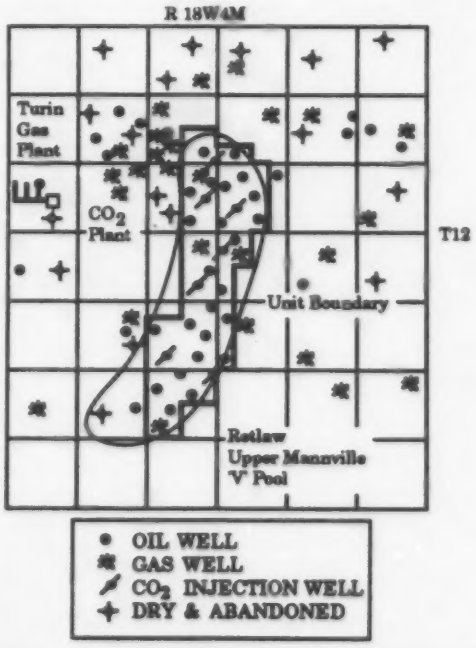
LOCATION
Section: 4, 9, 10, 15, 16, 21, 22, 27, 28 Township: 12 Range:18 W4M

PARTNERS:

Ulster Petroleums Ltd.	42.630578%
Atcor Ltd.	16.356042%
Canada North West Energy Ltd.	14.636474%
Acanthus Resources Ltd.	1.528604%
Bobby Burns Petroleum (1977) Ltd.	12.175636%
Scurry Rainbow Oil Limited	3.106713%
PanCanadian Petroleum Limited	6.452127%
Sceptre Ltd.	1.537419%
Bow Valley Industries Ltd.	1.537419%
Plaza Oil & Gas Ltd.	0.038988%

N.B. AOSTRA is a consultive participant in this project.

PROCESS: CO_2 Immiscible Flood and Water Flood (WAG)
Note: All CO_2 injection wells converted to water injectors. Re-injection of produced solution gas and CO_2 started July 1990.
START-UP: 1983 (Applied for Commercial Project Status)



TERMINATION: Experimental status terminated December 31, 1990

DESCRIPTION

PILOT AREA: 1133 ha
WELL PATTERN: Seven irregular patterns.

NO. OF WELLS:

Injection	7
Production	25
Observation	0

FACILITIES

Produced CO_2 and gas compressed and re-injected at battery facility.
ARTIFICIAL LIFT METHODS: Standard Pump Jacks
STORAGE FACILITIES: Standard oil battery facility.

RESERVOIR

Geological Horizon:	Retlaw Mannville 'V' Pool (Glauconite Sandstone) (Mannville with hydrophilic clays)
Depth to Top of Formation:	1070 m.KB
Reservoir Thickness: net:	2 - 2.5 m
Original Temperature:	35°C
Original Pressure:	11,376 kPa
Average Horizontal Permeability:	50 md
Average Porosity:	18%
Average Water Saturation - S_w	25%
Average Oil Saturation S_o	75% pore volume
Oil Viscosity at Reservoir Temp.	11 mPa.s
Oil Gravity at Reservoir Temp.	916 Kg/m^3
Primary Production Rates:	3-40 m^3/well/day
Source:	Pilot Operator

Vikor Resources Ltd.

Joffre - Phase I

LOCATION
Section: 15, 17, 20 & 22 Township: 38 Range: 25 W4M
PARTNERS:

AOSTRA	75%
Vikor Resources Ltd.	14%
Unit Partners	11%

PROCESS: CO_2 Miscible Flood (WAG) and Mobility Control Testing
COST: Capital - $7,500,000
START-UP: December 1982 - First CO_2 Injection January 1984
TERMINATION: 1990

DESCRIPTION

PILOT AREA: 129.5 ha (2 patterns)
WELL PATTERN: Two inverted 5-Spots plus two offsetting water injection wells.
NO. OF WELLS:

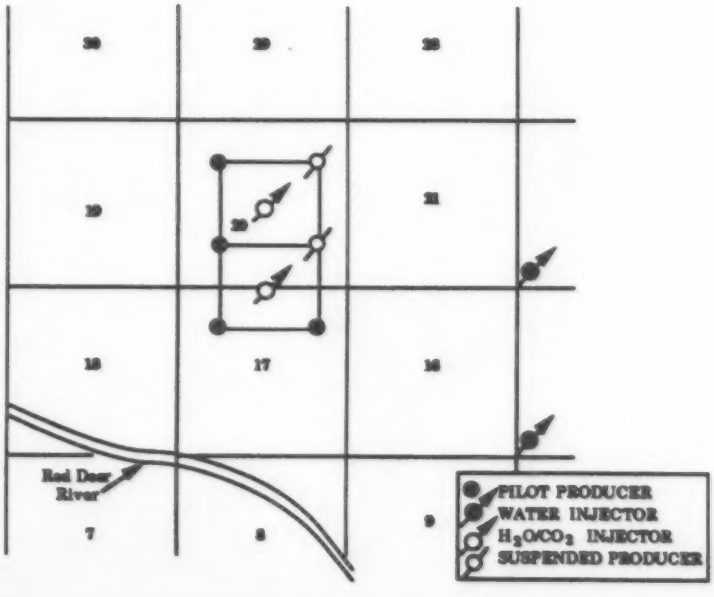
Injection	(water) 2
	(CO_2 + water) 2
Production	4
Observation	0

FACILITIES

CO_2 Injection: common with Phase II
ARTIFICIAL LIFT METHODS: Conventional; subsurface pumps.
TREATER TYPE: 3-phase test and group separator and 3 phase treater.
TRANSPORT: Crude sales through (LACT) to Gulf's Pipeline

RESERVOIR

Geological Formation:	Joffre Viking A Sand
Depth to Top of Formation:	1475 m.KB
Reservoir Thickness:	
net:	3 m
gross:	4.5 m
Original Temperature:	56°C
Original Pressure:	7760 kPa
Average Horizontal Permeability:	500 md
Average Porosity:	13%
Initial Water Saturation	30%
Oil Saturation After Waterflood	Appx. 40%
Oil Viscosity at Reservoir Temp.	1-2 mPa.s
Oil Gravity at Reservoir Temp.	813 kg/m^3
Primary Production Rates:	7 m^3/well/day
Source:	AOSTRA



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